THE IRON TRADE REVIEW

VOLUME XXVI. CLEVELAND, O. OCTOBER 26, 1893. CHICAGO, ILL. NUMBER 43.

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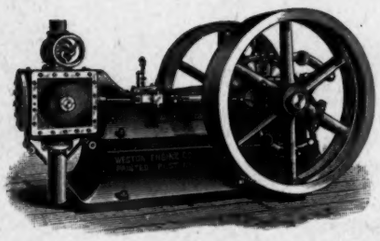

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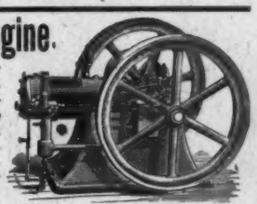

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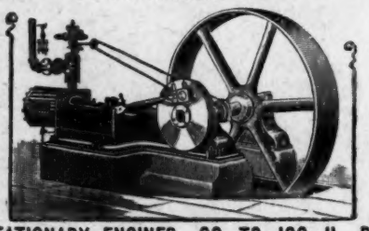

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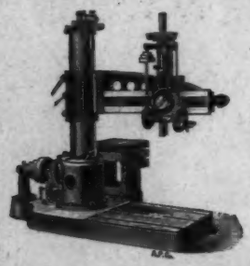

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THE IRON TRADE REVIEW

VOLUME XXVI. CLEVELAND, O. OCTOBER 26, 1893. CHICAGO, ILL. NUMBER 43.

THE WEEK IN IRON CIRCLES.

GENERAL FEATURES.

It is to be expected that the iron trade will share in the better feeling begotten by the news that silver purchase repeal is certain. Two months ago, when the House action was supposed to carry with it the assurance of Senatorial concurrence, there was thought to be some slight betterment in business along with the increased hopefulness. To what extent this would have grown, but for Senatorial delay and obstruction, is only a matter of conjecture. Since loans involving large amounts have been waiting upon silver purchase repeal, it is probable that the latest development at Washington will modify the bank policy of accumulating, which has been a continuing handicap to business. If it shall be followed up by legislation tending to reinforce the Treasury gold reserve and notifying Europe of the intention of this government to maintain its supply of gold, the gain will be still more positive. The week has brought forth no new development in the iron trade. Prices have not declined since the last report and it is probable that more mill capacity is active to-day than at any time since the June shut-down. But there is so little large work coming up, in any direction, that no early change from the conditions of the past two months can be expected. It is certainly true that the situation has not grown worse. The competition for 100 ton orders is still as intense as for 1,000 tons under ordinary conditions. From the East there are reports of good demand for small and medium sized lots of finished material, quick delivery, and note is made of a continued eagerness of Pittsburg mills for Eastern business. One small order for ship plates was secured by a Pittsburg mill on a basis that would scarcely net 1.40 on cars at Pittsburg. It would seem that billets have reached rock bottom, even from the mills of the cheapest producers, contracts aggregating 25,000 to 30,000 tons for far forward deliveries being reported from Pittsburg, at prices said to range from $17.60 to $18 Pittsburg. While there is no change in the steel rail situation and less than one-fifth of the possible production was achieved at the various association mills last month, it is reported that a considerable reduction in price is contemplated, and this may lead to some contracting for needed renewals. There are some indications that a better demand will materialize in the near future, in other kinds of railroad work. Car builders will not begin winter operations with the amount of work anticipated, but they will be compelled very soon to make contracts which have been long deferred. In the East shipbuilding work is being pushed, but no new contracts for material will come up in the near future. The demand from lake shipyards is practically nothing at the present time, and there is no outlook for the winter. Lake tonnage was far more than adequate to the past season's requirements, and possible investors will await the developments of another season. The pig iron market is entirely a waiting one. Negotiations that were almost matured some weeks ago, that would have taken a considerable tonnage off the regular market, may be taken up again, with better results, in which event the restriction of output may have a better chance to make itself felt. A few lots have gone upon the market recently, which had been held as collateral by banks, or received by railroads in payment for transportation. These have been in part responsible for the extreme weakness reported in some quarters. In Western markets no further concessions on prices have been made the past week, yet demand does not grow, and further restriction of output may be looked for.

THE CLEVELAND OUTLOOK.

Shippers of ore have reached the rounding-up point, and from this time out one after another will drop from the list. Ore charters cut no figure in the freight market any longer, and the 90-cent rate from the head of Lake Superior is likely to be the basis of the comparatively few trip engagements yet to be made. The greater portion of the ore remaining to be brought down is already covered. Mesabi shipments will equal those from the Gogebic and Vermilion, in the few weeks that are left, and the three ranges together have yet to ship less than 200,000 tons. Interest among ore men centers in the tests of Mesabi ores that are being made in the Valleys and in the Pittsburg district. The proportion of these ores that can be used to the best advantage will be quite well determined before the opening of another season. On this determination largely hinges the other question, much discussed since the combination was announced, of the extent to which Mesabi Bessemers will dominate the market the coming year. Valley furnaces that have been largest users of the new range ores are now employing about 60 per cent. of Mesabi in their mixture. If it be found undesirable to run a furnace on all-Mesabi, it can be seen that the price of Mesabi ores, while it will influence them, will not determine those of other ores. There have been further recent sales of non-Bessemer, outside of the trustee sales of Menominee non-Bessemers heretofore noted. Two sales of 15,000 tons each are reported, at prices above those secured in the trustee sales. The pig iron market develops no changes. Foundry operations are still curtailed. Southern iron finds little sale in districts naturally tributary to the valleys, prices on it being no longer competitive. Mahoning Valley mills remain tightly closed, and in Cleveland iron and steel works, operations continue on a limited scale. Structural material is called for only in small lots and the outlook promises nothing different for some time to come.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

No business of any consequence has been transacted in the past week, and as there are no inquiries of any size in the market it is hardly likely that sales will amount to anything in the coming week. This applies to all classes of iron and steel. The only news of interest for the week is the reported intention of the Illinois Steel Co. to start up their Joliet mills on or before the first of November.

PIG IRON.—No sales of sufficient size to mention were made in the past week, every one, of the dealers in pig metal reporting a very dull market. While there are a few inquiries out for round lots of iron, it is hardly likely that any orders will be placed in the near future, as business in almost every line appears to be hanging upon the action of Congress. Deliveries are going forward fairly free but not so much so as to give any hope for any increase in the demand.

BARS.—A little more inquiry is noted, but sales are still small, and there are but few of them. Quotations have fallen off slightly, and are now made on a basis of 1.42½c to 1.47½c for iron, and 1.57c to 1.62c for steel bars, f. o. b. Chicago.

STRUCTURAL MATERIAL.—There were no large contracts placed in the week, the demand being limited to small lots, for which there is a slightly diminished inquiry. Quotations are, beams, 1.85c to 1.90c; angles, 1.75c to 1.90c; plates, 1.85c to 1.95c; tees, 1.95c to 2.05c.

RAILS AND TRACK SUPPLIES.—A slightly increased demand is reported, but only for small lots. No large orders have been taken. Prices remain as last reported, rails, $30 to $32; track bolts, 2.55c to 2.60c; spikes, 1.90c to 1.95c.

BILLETS.—Enough orders have been taken by the Illinois Steel Co. to warrant the starting of their Joliet mill, and this will be done, it is announced, on or before the first of November. The men have agreed to a scale based on $20 Joliet for billets, and this is the price which has been secured for the orders placed. It is not expected to run the mill full time, but only about 10,000 tons will be rolled in November.

SHEETS.—Black sheets have had a very fair demand in the past week, both from store and for mill shipment. Prices range from 2.75c to 2.80c, f. o. b. Chicago. Galvanized iron has had a much better demand from store, and mill orders have become so plentiful that several of the mills have had to refuse business, as their capacity is taxed to fill orders already placed. Quotations are the same as last week—70 and 10 and 5 per cent. discount.

MERCHANT STEEL.—Specifications are coming in a little more rapidly of late, but the new business taken is very small. Sales from store have reached a fair amount, but are still hardly satisfactory. Quotations are unchanged. Open-hearth spring steel, 2.15c to 2.25c; machinery, 2c to 2.20c; tire, 1.95c to 2.10c; crucible spring, 3.50c; machinery, 4.50c to 4.75c; tool steel, 6½c and upwards.

PLATES, TUBES, ETC.—No business of any consequence has been done, and there appears to be very little in sight. Quotations are as last reported: Tank steel, 1.75c to 1.80c; shell steel, 2c to 2.10c; flange steel, 2.20c to 2.30c; fire box steel, 3.75c to 4c; tubes, 67½ to 70 per cent. discount.

OLD RAILS AND WHEELS.—There seems to be no demand for old material, and while quotations are given, they are only nominal, and would probably be reduced considerable on actual sales. Old rails, $14.25 to $14.50; old steel rails, $10 to $13, according to length; old wheels, $13 to $14.

SCRAP.—A small sale of forge iron was effected last week, but otherwise the market was quiet. Quotations are made: No. 1 forge, $10; No. 1 mill, $8; axles, $15; cast borings, $5; wrought turnings, $6.50; axle turnings, $8; mixed steel, $7; leaf steel, $14.50.

GENERAL MARKET RESUME.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. The transactions of the week have been on the same limited scale noted in weeks preceding, with the exception of those in billets, which have totaled a round tonnage. It is reported that contracts aggregating 25,000 tons, have been made for far forward deliveries. Prices are said to range from $17.50 to $18. In pig iron it is the disposition of makers to hold rather more firmly, this attitude being rather due to the fact that there are few opportunities to get contracts, and there is little to be gained by making special offers. In Bessemer iron a few sales of 500 tons each are reported at $11.50, which is about the present market. Mill iron has shown an irregular market due to the sale, now and then, of portions of a large block held by the sheriff. The low prices on this iron has tended to demoralize the general market. A few transactions are to be noted, on the basis of $10.85 to $11. Another city furnace has started up, to run on mill iron. In finished material the outlook is no more promising. There is so little demand that a mill is always found ready to make an extremely low figure. This scantiness of new business is accented by the continued slowness of specifications on old orders.

Cincinnati. Everything in the iron trade continues to lag. While there have been no specially unfavorable developments, nothing whatever has occurred the past week to impart life or movement to business. The dreary wrangle in the Senate has acted like a damper on everything. The prospect, a few days ago, of a compromise on a fairly conservative basis, was hailed with satisfaction, although sentiment throughout the iron trade strongly favors unconditional repeal. With something settled in the national finances, it is felt that even the prospect of tariff revision will not prevent a slow recovery towards normal conditions. It seems to be generally accepted that ores will be put on the free list, which will mean a great advantage to steel works on, or near the Eastern seaboard. Most manufacturers, however, have no fear of their ability to adjust themselves in time to the new conditions, though the reduction of wages to the standard prevailing in England and Germany will be an enormous change for American workingmen, and sharply curtail their purchasing and consuming ability.

Buffalo. A quiet and slow market continues to prevail. Judging from shipments there is something less than half the usual amount of pig iron being consumed in the field of tributary to this point. On the other hand, production of pig iron has practically stopped in New York and New England. To the latter fact, and the lessened output everywhere, is probably due the steadiness of prices. There are no lots pressing for sale, and while concessions are made to secure desirable orders, the schedule of prices here given is quite generally the basis of sales.

THE IRON TRADE REVIEW

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IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.

PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND:
27 VINCENT STREET.
A. I. FINDLEY, Editor.

CHICAGO:
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OCTOBER 26, 1893.

THE TREASURY DEFINITION OF "PRODUCED."

We can only admire the persistency of the Boston *Commercial Bulletin* in hitting the inconsistency of the treasury department, as exhibited in the recent tin plate ruling, and in a contrary ruling on the same question when raised in regard to pearl buttons. Some of the *Commercial Bulletin's* political contemporaries have attempted to give a political twist to the discussion, and thus take it beyond the domain of reason—since partisanship and reason do not dwell together in latter-day journalism—but it rebukes their inuendos by declaring its non-partisanship and citing its approval of Assistant Secretary Hamlin's policy in other matters. It is the *Commercial Bulletin's* contention that Mr. Hamlin took an utterly illogical position in accepting the decision of the court of appeals that pearl buttons, finished in this country, are produced as buttons in this country and in declaring that steel plates made into tin plates in this country are in the meaning of the law "produced" abroad.

In this connection the efforts of the opponents of the McKinley law to interpret the intent of its framers are an interesting commentary. It has been asserted, for example, that the McKinley bill increased the duty on black plates, and therefore it was intended to prevent their importation and to build up a steel plate industry in this country. A reference to the bill will show that the duty on black plates was not increased. But while the question of "intent" is up, it is fair to consider what was the intent of the Treasury department in making fish of one industry and fowl of another. On this our Boston contemporary remarks:

According to the McKinley tariff the duty on tin plate is dependent upon the amount "produced" in this country. In order to break down the duty Mr. Hamlin has declared that tin plate made from imported steel sheets is not tin plate "produced" in this country, though he accepted the ruling of the court of appeals that pearl buttons imported without shanks and shanked here are produced as buttons in this country.

In both cases he struck an American industry. In the second he had judicial justification in violating the spirit of the tariff. In the tin plate ruling not only the spirit and letter of the tariff but his own previous ruling are flagrantly overridden.

We submit that if by law a vessel produced entirely from foreign materials is admitted to American registry as a "product" of the United States, if by judicial decision a pearl button imported ready for use except for the drilling of holes only becomes a button in the eye of the law after those holes are drilled, then tin plate made from foreign materials is as truly produced as such in the United States as American yarn spun here from Australian wool.

As far as our tin plate manufacturers are concerned, the returns for the quarter ending June 30 indicate that they can comply even with the unjust requirements of the treasury department. Of the product in that quarter, 17,167,000 pounds were made from American black plates and were of the weight counted in determining whether the one-third requirement has been met. Add to this, 2,322,455 pounds of tinned or terned articles made from American sheet iron or steel, and the total is 19,489,455. Multiply this by four and we have very close to the 79,307,939 pounds, which equal one-third the importations in the year ending June 30, 1892. Taking the production from American black plates just as it ran, in the year ending June 30, 1893, and it was about five-eighths of the amount necessary to retain the duty under the Treasury department's decision.

At their present capacity, the sheet mills of the country are probably not equal to an annual demand of 79,000,000 pounds of sheets less than 63 pounds, to 100 square feet. They have had little encouragement in the past year to invest in larger equipment, and under the existing stress not a dollar will be invested in increasing capacity. It would be expecting the miraculous to look for capital to exploit itself in enterprises which all the power of an administration was exerting itself to foredoom to failure.

BRITISH IRON EXPORTS TO UNITED STATES.

The export of British iron and steel for September was lighter than that of August, both in the aggregate and in the amount of business done with the United States. The scarcity of coal and the consequent shrinkage of iron products due to the miners' strike, accounts for some of the falling off, but, as one of our English contemporaries remarks, "other causes are at work throwing dark shadows over our foreign trade." The drop in the total of principal British exports to this country, taking in textiles, iron and steel, pottery, etc., is from a valuation of £955,002 in August to £615,735 in September.

In iron and steel exported to the United States the decrease is represented by a total valuation for August of £266,746, against £215,410 for September.

Taking the figures from the London Board of Trade report, the falling off in business with this country is apparent from the appended statement for the last three Septembers. Side by side with the figures for last month we have put those for August of this year, showing a difference of about 20 per cent. between the totals for the two months:

	September, 1893, Gross Tons.	August, 1893, Gross Tons.	September, 1892, Gross Tons.	September, 1891. Gross Tons.
Pig Iron	545	1,327	4,048	5,643
Bar, Angle, Rod and Bolt Iron	38	137	108	568
Tin Plates and Sheets	13,789	15,784	22,535	11,139
Wire Iron and Steel	193	369	184	184
Hoops, Sheets and Plates	1,062	1,188	2,037	205
Cast and Wrought Iron	285	397	325	216
Steel Unwrought	786	1,459	1,763	2,215
Manufactured iron and Steel combined	143	102	123	79
Old Iron	24	109	1,266	2,012
	16,865	20,872	32,389	22,261

The general restriction of buying in the United States due to the depression, is in part an explanation of this showing. Another cause has been operative, too, as set

forth in this paragraph from the London *Iron and Steel Trades Journal's* review:

We can draw no other conclusion from the figures than that an early reduction of the tariff is regarded as imminent in America; that until this takes place imports will be kept at the lowest possible level, and afterwards American business will be worth much more to our manufacturers than it has been for many years.

If waiting by importers, because of the changes in the tariff that are expected to cheapen prices, has done so much, what wonder that buyers in the home market have cut down the volume of trade tremendously by waiting for the same changes. Not only is the effect of tariff uncertainties thus emphasized by our contemporary, but it intimates that British manufacturers are to have some compensation for the comparative meagreness of their returns from trade with the United States the past year, in the larger access to our markets under reduced tariffs.

Whether American iron and steel masters will permit their market to be wrested from them, even under reduced duties, is a question; much will depend upon the extent to which labor costs can be reduced. And Germany and Belgium are likely to make quite as much trouble as Great Britain; not on tin plates, which is the main dependence of British exporters in reckoning on increased trade under low tariff, but on plates and shapes.

In compensation for any falling off in his trade at home, that may come through larger importations of European iron and steel, the American iron master is uniformly commended to the markets of the world. When the day comes that our iron and steel manufacturers go out to struggle with Great Britain, Germany and Belgium for these distant markets we shall expect to find in our iron market reviews paragraphs like this from the current issue of the London *Colliery Guardian:*

The aspect of affairs in South America is profoundly disheartening, and British ironmasters will clearly have to exercise great care and caution in undertaking engagements in that quarter of the world.

For "South America," other countries would be substituted from time to time, according to the shifting of financial trouble from one quarter of the world to another. How gladly would our British brethren exchange their South American iron trade, for example, for the merest fraction of the choicest market on the globe—the one coveted by outside producers everywhere and undervalued only by the theorists at home who would drop substance to join in a chase for phantoms.

HOLDING OFF FROM A FALLING MARKET.

Referring to the policy of railroad companies and other large producers in restricting purchases in the way that has been done for months, the *American Manufacturer* observes:

There is just so much wearing out of plant and machinery and equipment every year; and it is doubtful whether it is wise policy to buy very much less one year than another, simply because traffic falls off and prices of material fall. This is, and has been, the policy of all large consumers on this side of the water. It is a well established fact that more money is spent, and more work that could be posponed is done, when prices are advancing, than when they are declining. It seems to be natural to consumers to buy on a rising market, but when prices begin to decline the railroads make every possible restriction, and instead of expanding necessary work orders are countermanded, deliveries are postponed, and every possible step taken to restrict outlays in the direction of improvements and even maintenance. When certain improvements are recommended, with all careful detail, by engineers, it would seem to be the wise course to make their improvements, whether pig iron sells at $14, $10 or $12 per ton, whether steel billets are $20, $19 or $18 per ton.

As far as the hesitation of railroad buyers is confined to steel rails, the reason for it is not found in a falling market. The *Railway Review* remarks on that phase of the situation:

It is said in Pennsylvania that steel rails will soon be quoted at $28, but railroad authorities should take note of the fact that steel blooms selling at Pittsburg under $17, means steel rails at $22 to $24. The present price of steel rails is entirely abnormal, and a heavy demand would cause a tumble that would surprise the trade. Well posted railway managers see this, and are not making any effort to buy rails for track laying which can possibly be postponed, thinking that the steel rail combine must go as others have.

It might be a difficult matter, at times, to decide whether deferred contracts were not a cause, in part, at least, of a falling market, or whether both the deferring of contracts and the falling of prices were not symptoms of the same disturbance of equilibrium between supply and demand. But if it were the deliberate policy of railroads to restrict purchases to the lowest limit on a falling market, that would be doing simply the natural thing, and following a rule that individual buyers almost universally follow. A falling market continually argues lower prices a little farther on; and it is of no use to suggest that on a previous occasion, long delayed purchases have finally been made on a basis above what would have been paid had the buyer come earlier into the market. History does not necessarily repeat itself in these matters. Because one period of decline has been followed by a reaction carrying prices even beyond the average before the decline set in, does not argue that the next decline may not take them to a basis permanently lower than anything that has preceded. The indications are, in fact, as far as the present depression is concerned that the reaction cannot be to the old basis.

It is no doubt true that many railroads would have gone into the market the past Summer for extensive equipment requirements had it been possible to finance such operations. But in this instance it was a concomitant of the falling market that money could not be had on any sort of security. Moreover, a falling market, with whatever attendant conditions, is not the kind of market on which railroads can best enlist foreign capital in their improvement bonds.

It is of no profit to warn buyers, whether they be railroads or whether they be manufacturers who are, in turn, to be sellers, that there will come some day, and suddenly, a reaction that they will understand, to their cost. It is the uncertainty of that day that paralyzes contracting meantime. Railroads are like individuals. Their view of the future takes its color from present conditions. Hence increasing business due to general industrial expansion suggests for the still greater enlargment anticipated, expenditures that would not be entertained in a time of waning prices and curtailed operations. The increased prices that are paid under these circumstances find more justification in the conditions surrounding them than would investments at the lower prices of depressed times.

"There will be a sudden termination of all thus apathy, some day, to the cost of buyers," a contemporary avers; of this there is no question. Meantime, if the railroads can be persuaded of their duty in the premises, they may even cause the reaction, instead of waiting with their contracts until the advance has gone well along to flood tide.

Two contemporaries print the statement, in Duluth

correspondence, that the total iron ore shipments this season from Lake Superior were 4,100,000 tons up to Oct. 12. We regard the actual total as quite large enough for a season like the present, without swelling it beyond the fact. The shipments through the Soo, up to Oct. 1, which include all ore from Lake Superior ports, were 2,846,597 gross tons. Since Oct. 1 the shipments from all Lake Superior ports have been from 100,000 to 125,000 tons a week, so that the total Oct. 12 did not very greatly exceed 3,000,000 gross tons. Whatever went from Escanaba and Gladstone is to be added to this amount to get the total. We see nothing in present shipments to indicate that the season's total will go above 5,500,000 tons.

VIEWS AND INTERVIEWS.

Mr. H. E. Collins, of Pittsburg, writes us questioning the statement in a recent issue of the *Bulletin* of the American Iron and Steel Association, that "a sentiment favorable to silver is growing rapidly in this country." We have not before us the context of this quotation. It does not appear on the face of it whether it refers to a growing sentiment in favor of a bimetallic standard or whether to a growing desire for a continuance of the present policy of the government relating to silver purchase. The rank and file of the people have not been heard from to any extent, in the midst of all the agitation; we do not believe the mass of voters of the country could answer many questions as to the issue that has been discussed at Washington, from dog days into these weary autumn weeks. Within the reach of newspapers that have preached silver as the money of the people there has been, no doubt, a strengthening of the sentiment that "silver is the poor man's money;" and possibly a count of noses at the polls would show a majority on that side. But among men who understand measurably questions of finance—among men on whom the stability of the country's financial and industrial interests depend—there is, as is well known, a practical unanimity as to the danger of continually pursuing the policy of attempting artificially to hold up silver by parting with gold. There is, we take it, a strong sentiment, which there has been no opportunity of late years to measure, in favor of the continued use of silver as money—not as subsidiary coin, but on a parity with gold, at a ratio about which there is wide variance of view. We do not believe that the legislation the present administration, is pressing upon Congress is an attack upon silver as money; but that there are just as good friends of silver among the repeal forces, as on the other side. They are not silver's "fool friends," however, and that is the chief difference.

* * * *

In discussing the disposition of machinery exhibits at the World's Fair, the *Iron Age* thinks that the experience of one large machinery house with an auction sale will not encourage further efforts in that direction. Few of the machines thus sold brought two-thirds of the lowest price previously quoted and some sold below half price. There does not appear any general disposition to sacrifice on machines merely to get rid of them. Where sales have been made for export, it is likely that in most cases shipments will be made from the shops, since machinery for export requires very careful packing. Storage in Chicago with a view to future sale is not regarded profitable. Firms having Chicago warehouses can profit by them, but with the majority of exhibitors there is no hurry about making arrangements for the disposition of their machines. Those that can be readily removed to the shops will be returned at once; others may wait in machinery hall—since it will not be taken down this winter—in the hope that a sale may be made meantime.

* * * *

Mr. W. G. Pollock, secretary and treasurer of the Pittsburg & Lake Angeline Iron Co., expressed himself to an interviewer on a recent trip to Youngstown, O.: "There is no trade in our business. We are absolutely doing nothing. I have never seen it so quiet in the ore line as it is now, but when the reaction comes, as it will, there will be a boom that will make everybody happy. What about the iron ore syndicate? Well, we are not in it, though I guess it will be a go if they have money enough to handle it. It would not require such a great amount of capital either to control the Bessemer ore mines. I know that I made a computation once as to what amount would be necesssry to control the Bessemer mines, and I think it was something like twelve or thirteen million dollars." Asked whether such a syndicate would be beneficial to others in the business, Mr. Pollock said: "Yes, I think so. The men who put their money into such an organization would not do it for amusement. They would expect to secure good dividends on the investment, and to do that they would necessarily be compelled to keep up the price of ore. If they cut the price they would injure themselves, and I hardly think they would be foolish enough to adopt such a course. In my judgment such an organization would stiffen the ore trade."

Wage Questions at the Mills.

At the Wayne Iron Works of Brown & Co., at Pittsburg, 135 puddlers were discharged last week because they refused to sign an agreement not to belong to any labor organization while in the employ of the company. The works resumed on Monday with non-union men, one-half the puddling furnaces being started.

At the Sligo mills of Phillips, Nimick & Co., Pittsburg, the men were notified last week that they would have a week to decide whether they would accept a 10 per cent reduction from $5 for puddling. The reduction will be refused and it is expected the mill be started non-union.

There have been conflicting reports as to the result of the vote by the Amalgamated Association on the proposition to accept a 10 per cent. reduction on the sheet mill scale. Early in the present week the indications were that the vote had been adverse, but on Tuesday the acceptance of the reduction was reported. The meeting of the sheet manufacturers called for Tuesday to receive the announcement of the vote was not held, the returns from a few lodges being still out.

The Linden Steel Co., Pittsburg, which resumes under an arrangement with its creditors for an extension, re-opens on a non-union basis. The plate mill has been running non-union for two weeks.

The Oliver Iron & Steel Co.'s South Fifteenth street mill, Pittsburg, resumed in part on Tuesday, with old employes. Some of the puddlers went to work at $5 per ton, but without the scale.

SECRETARY T. W. McCreary, of the Ashtabula (O.) Land Co., who is also connected with the Ashtabula Steel Co., has written a newspaper card contradicting the report that the company has realized a large sum of money from the sale of lots, but would do nothing more on the proposed plant. He explains that while a goodly number of lots have been sold, it has been on the certificate plan, the buyer paying $5 down and the balance when the deed is delivered. Less than $200 has been realized from this source while the company has expended $7,000 on land, options, surveying, etc. The immediate execution of the company's plans regarding the steel plant has been interfered with; bnt it is expected that these impediments will be disposed of and that the original plans will be carried out to the letter. Meantime no attempt will be made to boom lots, the company preferring to let the actual development of the steel plant project show for itself.

RECENT advices to the Bureau of the American Republics from Valparaiso show that the subject of establishing manufacturing industries in Chile is receiving general attention. The manufacture of iron and steel is a special subject of interest on the part of the Government. A concession has been granted to Mr. Chas. E. Lister, who is now engaged in organizing a national company for the manufacture of iron and steel.

It is reported that J. W. Maxwell, of the Lima (O.) Steel Casting Co. is negotiating with a land company of Muncie, Ind., for the erection of a plant for the manufacture of merchant steel.

THE Sethness Chemical Co., 262 N. Curtis Street, Chicago, are in the market for a 50 h. p. automatic engine, second hand.

AMONG THE IRON MINES.

Marquette Range:—

Nearly every day we see something concerning the "paralysis" of the Marquette range, which produces "hard ore." From one end of the country to another the "old hard ore range has been knocked out." It may be news to those who have been giving tongue to this cry that the so-called hard ores do not represent a quarter of the output of this country more than three-fourths of the product being hematite of the soft variety. But three companies are mining hard ore exclusively, these being the Republic, Champion and Volunteer. Of these the product of the Republic is largely friable and as readily smelted as any of the softer ores. It is a ready seller, also, and at highest price. The consumers of Champion mine ore were located on the Atlantic seaboard where for years the output was sent, but Cuban competition has destroyed this market, and a new one has not yet taken its place. The ore of this mine will run from 64 to 67 per cent. iron and every pound is of bessemer grade. There will be a demand for this ore. The trade wanting the toughest iron and steel, an article possessing fineness and great tensile strength, will call for this ore. It will be needed in mixture with the softest varieties. Should it not be demanded, then we have the softer variety in abundance, and will probably be able to mine it even in the face of statements to the effect that we are not in the market today.—[Iron Ore, Ishpeming.

Negotiations are in progress looking to a resumption of work at the Blue mine, near Negaunee.

The employes of the Buffalo Mining Co. are now assured that they will receive their back pay about Nov. 1, and in the same connection there are rumors that work will be resumed, but this latter report is to be taken with allowance.

Mesabi Range:—

That the Rouchleau Iron Co. has a big mine here is now evident. Cole & McDonald succeeded in finding 118 feet of ore in the last hole put down just along side the county road. The surface is 131 feet. Mr. Cole is of opinion that the deposit extends southward at least half a mile further. The next hole will be started 300 feet to the south and east. After the length of the deposit is determined the width east and west will be tested. The indications are good that this deposit also extends over the greater portion of one forty owned by the Chicago Iron Co.—[Mesabi Range, Biwabik.

At a meeting of the Ohio Mining Co. at Duluth a proposition from the Ohio Iron Co., sub-lessees of the mine, was considered, and it was arranged that active operations be resumed.

A party of Norrie owners made a trip over the Duluth, Mesabi & Northern road last week to look over the prominent shipping mines on the new range. It was composed of S. S. Curry, president of the Metropolitan Land & Iron Co.; H. S. Hazelton, secretary, and S. Clement, L. J. Petit, O. W. Potter, E. C. Potter, Francis Hinton, J. D. Day and John A. Whaling.

Vermilion Range:—

Shipments from Two Harbors for the week ending Oct. 19 were 16,244 tons of Vermilion and 4,839 tons of Franklin, on the Mesabi—total, 21,083. Total Two Harbors shipments for the season, 809,978 tons—740,502 tons of Vermilion and 69,476 tons of Mesabi. The Two Harbors *Iron News* says: "There remains but about 4,000 tons of Minnesota at the mines for shipment, and this will soon be exhausted. Only crushed ore is now being shipped. The Chandler is about cleaned up, and whether further shipments will be made is not yet given out."

Gogebic Range:—

The shipments of ore from Ashland for the week ending Oct. 15 were 31,053 tons. Total for the season, 1,037,983 tons. The total shipments by mines are as follows: Ashland, 32,876; Aurora, 157,973; Colby No. 2, 45,615; Tilden, 126,042; Germania, 4,975; Iron Belt, 17,625; Montreal South Vein, 2,606; Montreal North Vein, 28,803; Palms, 2,302; Eureka "A", 1,949; Brotherton, 14,643; Careys, 32,514; Comet, 8,385; Eureka, 26,028; Newport, 102,860; Norrie, 228,476; East Norrie, 78,135; Pabst, 91,891; Jack Pot, 1,651; Sunday Lake, 19,344; Davis, 13,282.

Menominee Range:—

It is reported that the Chicago, Milwaukee & St. Paul road is negotiating for control of the Mansfield mine. Its line runs within two miles of the mine, and the company already has spent considerable money in prospecting in that vicinity. The Crystal Falls *Diamond Drill* says that a change of owership is likely to be the outcome of the proceedings instituted against the Mansfield Iron Mining Co. to recover wages due the men at the time of the collapse. Though the ore is of good grade, the mine has not yielded a profit on operations heretofore.

Superintendent Lindsay and Assistant Superintendent West, of the Chicago & Northwestern, spent last Tuesday in the city. We understand that the Northwestern management will be much more liberal in its dealings with the mining corporations on this range in the future. The management has awakened to the fact that our mines, in order to keep the wheels in motion and compete successfully with the Mesabi properties, must receive some assistance from the railroad company in the shape of a material reduction in rail freights, and this, we are assured, will be forthcoming another year.—[Range Tribune, Iron Mountain.

HARRINGTON FOUNDRY CRANE.

HARRINGTON FOUNDRY CRANE.

In devising a crane for foundry use that would be free from the jar often resulting from the use of the sprocket wheel and chain in the lifting of copes or moulds, Edwin Harrington, Son & Co., of Philadelphia, have introduced the mechanism shown in the accompanying illustration. As will be seen, the sprocket wheels of the hoist have been replaced by a drum having right and left spiral grooves, insuring the hanging of the hook always over the same point. There is no jumping or jarring; the movement is steady, the chain winding and unwinding with the regularity of a rope on a windlass. Thus the cope can be lifted and lowered with no danger of the sand sifting out, or of the mould "breaking down." The internal gears of the hoist are worked by means of a shaft extended far enough beyond the beams of the bridge to prevent the chain from interfering with the load, and this also enables the operator to stand at a respectful distance from a pot of melted iron.

The crane is operated by geared wheels throughout, and the shaft of the crane is placed inside the beam, thus saving room, and it moves the crane by pinions and intermediate gears, all of which have roller bearings, producing easy movement.

Among recent installations of the crane is one at the stove works and hollow ware foundry of Isaac A. Sheppard & Co. at Philadelphia. They write that the Harrington crane is well adapted to the use for which it was intended; that it lifts a mould without jar, and that they have had no trouble from the breaking down of a mould at the critical point.

MACHINE SHOP AND FOUNDRY.

WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular meeting of the Western Foundrymen's Association was held Wednesday evening, Oct. 18, 1893, at 225 Deaborn st., Chicago, Ill.; Mr. S. H. Holly, of Marquette, Mich., in the chair.

Secretary Gardner reported that in answer to inquiries he had sent out to about 50 foundrymen to find out what the feeling was on the question of establishing a laboratory and having a chemist, he had received letters from the following firms: The Edward P. Allis Co., Milwaukee; Webster, Camp & Lane Machine Co., Akron, O.; Lane & Bodley Co., Cincinnati, O.; Rogers, Brown & Merwin, Chicago; S. Obermayer & Co., Cincinnati, O.; Hurlburt Manfg. Co., Racine Junction, Wis.; South Milwaukee Malleable Iron Works, Milwaukee; Walburn Swenson Co., Chicago; Joliet Stove Works, Joliet, Ill.

The secretary also made the following report: "At the last meeting the association also instructed the secretary to procure prices for the establishment of a laboratory and prices from chemists for taking charge of a laboratory. From informal inquiries I find it will cost from $350 to $500 to equip a laboratory, and of course the rent of the room would be added to that, which with the running expenses would amount to about $200 to $250 a year, making a total of about $750 a year. I have received propositions from Mr. Geo. Ellis of Chicago, Mr. R. N. Hubbard, of Columbus, O., and Mr. Wm. Molin, of New York, to do the work for the Association, Mr. Hubbard offering his services for $1200 per year, Mr. Molin, for $2000, and Mr. Ellis making a proposition of so much for determination.

Mr. William Moore, of the Joliet Stove Works, spoke as follows: "I should judge that the communication received from Mr. Molin comes very near to the actual cost of maintaining a laboratory for a year. And taking $4,000 or $5,000 for which from 2,000 to 4,000 determinations could be made, it is very evident that the proposition which we have received from Mr. Ellis would be the cheapest, as it would involve no risk. He offers to make sulphur and silicon determinations for one dollar each. Now these are by far the most numerous determinations to be made, and it seems to me his price on these is a reasonable one. The actual cost of making determinations in large laboratories, I am told, is much less than that. It is a small matter in large laboratories, where 15 or 20 men are employed, and where a large amount of business is done to reduce measureably the cost. I presume the estimate that Mr. Molin has made, if the association should equip its own laboratory and had enough work for one man to do, is very good. But it seems impossible, for the present, at least, for the Association to go into the laboratory scheme and assume the responsibility and expense. It may be in the course of the development of the Association that there will be a large volume of business and it will need a thoroughly reliable man, and the members of the Association can get the benefit of having the work done in a combined way. For the present, I should think the proposition made by Mr. Ellis, is the most favorable one that the members of this Association are likely to get.

Mr. Gardner: "We have had a proposition from Mr. H. O. Chute, of Chicago, offering to do the work for the Association, providing 25 members will agree to take five determinations a month, at the rate of $1.00 a determination. We had also had a proposition from the Armour Institute to do the work at a flat price of $1 a determination."

Mr. Moore: "I am a little shy of technical school determinations. Not but what they are perfectly reliable and I have no doubt that they would be satisfactory. Technical schools do reliable work, but I think a man who is doing the work as a business has the ability to give us more satisfactory work."

Mr. Thomas D. West: "This matter of chemistry is one that I have not followed as closely as I might have done, but it strikes me that we as an organization, intending to embrace as large a territory as we do, should have two or three chemists, in different sections of the country, so that persons requiring determinations could receive them promptly. I know in our business, we are very desirous of knowing in the morning about the cast of last night, before commencing the cast of to-day. It seems to me we might invite bids from chemists who are engaged by manufacturers, but who had some spare time on their hands. I do not like technical school work. In that I coincide with Mr. Moore. I do feel that the Association should have three chemists or three laboratories, one in Chicago, one in Cleveland and another down about where I am located. I do not think we could do much better than one dollar a determination."

Mr. Holly: "It seems to me that the establishment of a laboratory by the Association would be too much expense for us on the start. What we want is to increase our membership and make ourselves more popular. It seems to me the proper move would be to get a chemist who would do the work under the auspices of the Association and then outsiders would see that a benefit was to be derived by belonging to the Association."

Mr. West: "May I ask what called these propositions out?"

Mr. Gardner: "We had received propositions from Mr. Chute and the Armour Institute and from Hollis & Co. I wrote to Mr. Hubbard for his and Mr. Ellis sent his in at my request. I thought these would give an idea of the cost and it was not necessary to ask for any more."

Mr. Chute: "May I ask if any possible proposition could be submitted, which the Association individually or collectively could state they were in a position to accept. Is the Association in such shape that it could accept any proposition whatever for doing the chemical work? If it is not, had they not better inquire first if it is desirable to have chemical work done. The only way to find out about that is to believe what those say who have done that kind of work, or to take the testimony of those who are having it done. After ascertaining whether it is desirable or not, it seems to me from the number and variety of bids it would be very easy to decide which is the best proposition."

Mr. Gardner: "I would like to say in this connection, that at all the meetings at which this question has been discussed, it has been conceded that it would be a good thing to have a chemist of our own, or one who would do the Association work in addition to his own business. It has been conceded that the Association wants a chemist and the Secretary has been acting on that basis in securing these bids.

Mr. Holly: "It would seem to me that the financial basis of this Association would not permit us to go into anything of this kind."

Mr. Gardner: "The financial basis of the Association will not permit of hiring a chemist or starting a laboratory. The original plan of the Association was to have some outside chemist to the work. It was not supposed at the beginning that the Association would ever consider starting a laboratory of its own. The $4,000 proposition is entirely out of the question until the membership is larger. The only proposition that could be considered would be from a chemist who would do the work at a certain price per determination."

Mr. Chute: "I am not convinced that it is universally conceded that a chemist is desirable. I think it will be necessary to have a great deal more evidence brought to the foundrymen before they are ready to even give the subject a trial. When this subject was first broached and I made my proposition, I went around among the foundrymen and I found that while a great many are not strictly opposed to a chemist, yet very few of them were convinced that the laboratory would be of any financial assistance to them. I think it would be very desirable for the Association to get together a line of facts and publish them."

Mr. West: "It strikes me that the only way for this organization to do would be to secure the services of a chemist who will come in and say 'I will give you a price per determination and take my chances.' If the foundrymen have trouble with their iron and they know that at a reasonable price they can procure determinations, it would have great influence with them."

Mr. Chute: "I wish to say that no one who has had any experience with foundrymen, unless he has a fortune to back him, would take the chances of getting enough work at the rates which have been bid. The only possible consideration

of the low bids has been, in nearly every case, a guarantee that there should be a certain number. If the foundryman does not know it is of value to him and does not think so, he is not going to try the experiment, but if he is educated to the point that he believes it may be so then he may experiment. Until he is brought to that position, I do not think there is any one man who would take the chances."

Mr. West: "In my locality in many of the large foundries there are chemists who would be very glad to make determinations for any organization that might wish to use their spare time. There is hardly a chemist, but has more or less time at his disposal that he could devote to this kind of work. I can readily conceive that it is hardly practicable to start right in and give ones whole time to the work and expect it to pay him. We might receive bids from parties in actual operation who would like it as a side issue.

Mr. Holly: "I have listened to the remarks of the several gentlemen and it has convinced me that we are not prepared as yet to ask for bids. The question of the foundrymen being educated up to the use of a chemist is an important one. I suggest that the secretary should write to the several foundrymen that are employing chemists and find out if they are willing to tell the association what benefits they derive from chemistry; also write to the members of the association and find out from them what number of analyses they might want per month or per year. Upon receipt of this information I think then we would be in position to ask for bids."

Mr. Moore: "I quite agree with Mr. Holly. It seems to me that the evidence before the association is that while some of its members are extremely desirous of a combined effort toward laboratory work in some shape or other, yet the result of experience which has extended over a month or two would show that the members of the association do not agree as to the advisability of actually entering the work. I think most foundrymen who are alive to their business interests have begun to realize that chemistry has for them something, yet they don't know what. I think we are as yet a considerable distance from the point where there is enough actual, live, intelligent interest in the question of chemistry and its relation to foundry practice for this association to establish its own laboratory. The question has been discussed in previous meetings, and has taken up a good deal of time,—not more than the subject warrants but more than the progress that has been made in the matter warrants,—and it would seem to me that it is desirable for the present to give up the idea of a laboratory for the association or for combined effort at analyses and turn the work of the association into an experience meeting to get the ideas and experiences of the different members. There is a time coming, if this association grows as it ought to grow, when every member will realize the necessity and the profit there is in a thorough understanding of chemistry and a great deal can be learned which is not now known, for the subject is full of possibilities."

It was moved and supported that the secretary be instructed to advise those from whom he has received bids, that the association does not consider, at the present time, that it is in a position to consider the matter of a common laboratory or of common laboratory work. This motion was carried.

The following applications were received for membership in the association and were unanimously accepted:

The Connersville Blower Co., Connersville, Ind.

J. R. Williams, Mgr. Manning, Maxwell & Moore, Chicago.

Wrought Iron Bridge Co., Canton, Ohio.

The paper of the evening on "A New Center Blast Tuyer and Its Economical Advantages" was then read by Mr. Thos. D. West, the well-known author of foundry literature. It will be found elsewhere in this issue.

After the reading of the paper it was taken up for discussion by the members present.

Mr. Thos. H. Widdowson, of Mankato, Minn., to whose experiments the paper had referred, told of some work he had done in the same line, in which he had experienced good results, but he had not carried it on such length as had Mr. West.

Mr. West: "Mr. Widdowson and myself are entire strangers to each other. He is ignorant of my experiments and I of his. I would like to ask Mr. Widdowson if in any of his experiments he worked with a view of reducing his fuel."

Mr. Widdowson: "No, sir, we did not. I suppose you will notice that I spoke of putting in three pieces of fire brick; this was to overcome the trouble of which you spoke. In regard to the time of melting we noticed a decided improvement. It melted much faster, also the iron was much hotter all the time; towards the lower end of the furnace it would be a white heat. I want to state that this was a 26-inch furnace in which our experiment was made."

Mr. West: "I am satisfied that it is an advantage to use center blast in connection with the outside tuyers. The effort is to get the blast to the center of the furnace. That is the reason why it causes a saving of fuel. It is right at the center of it. You can blow with a much slighter blast. The effect on the lining is very little and the men like to use it. One objection to the center tuyer is you cannot get at it as you can at the outside tuyer. You must watch it. It is only with the very heavy heats that we find any difficulty with the drop. We found a little trouble with the outside tuyers and the center tuyer meeting."

Mr. W. A. Jones, of Chicago: "I would like to ask Mr. West one or two questions. I would like to ask him if he used a pressure blast and about what was the pressure indicated? Another thing that strikes me is that the temperature would have to be handled with a great deal of care, more, perhaps, than is possible with our ordinary droppers. It would seem to me that the charging of the cupola would endanger the cap very much. These are simply ideas that occurred to me in looking through and hearing you read the paper this evening. It is certainly the best method I have ever heard of to bring about perfect combustion. Some time past I had charge of a large foundry that used a Colliau cupola. We had to reline it every three or four weeks. The cupola was guaranteed and as it failed and our business was gradually increasing and we needed a larger cupola we did not feel like buying another of the same kind until the makers had lived up to their end of the guarantee. We got their practical man—well, to make a long story short, he did not do it, still we could find nothing better and we finally bought the larger one of the same make. But the matter of relining the furnace from time to time causes a great deal of expense and while our work has increased it is a question whether or not it evens up the cost in the long run."

Mr. West: "It was not a forced blast. I should judge the pressure would average somewhere about twelve ounces. Your conception of the device is very good, and my reason for bringing the paper before the association is that I am satisfied that it is in the right direction for perfect combustion. And if it is ever reached it is going to be reached by some such plan. If I had been in a position to do so I should have patented it. But business slacked up and the thing seemed to hang fire, and I therefore give the paper to the association that it may go to the public and some one may take it up for what it is worth. It is a question of great importance, and if you will follow it up you will see that if it is properly used you will have no touble with it. I have stated the objections and where I have had trouble. The main thing now to be found is a substance that is fireproof. When that is obtained you have everything desirable. It is quite an item when you can save $4 a day in fuel. I am satisfied that any one starting in with it can begin to save in fuel on the first day and reduce the bulk about twenty per cent. You can keep on reducing every day until you know just what you need."

Mr. Jones: "Have you ever thought of coating it with asbestos?"

Mr. West: I have thought of it, but it is not convenient to get this in my locality."

Mr. Jones: "I am inclined to think that the great amount of pressure should be in the center tuyer."

Mr. Moore: "I have been exceedingly interested in Mr. West's paper. I feel as if we had something new. We foundrymen—most of us—live in a very conservative way and go through very much the same routine every day. It certainly adds new zest to the business to have something new come up, aside from its practical features. This subject will give us a great deal of pleasure aside from its economical features—just the idea of having something new to think about. As I understand Mr. West, his experiments were made with a small cupola. Did you use the outer tuyers? Your first experiments were made with the center tuyers. Did you have the same results with the small as you obtained with the larger?"

Mr. West: "It was almost all done with the small cupola. We did not go in to see what we could do. It was a matter of necessity at first. We were satisfied enough with the result to go to work and cut a hole in the bottom of a large cupola. It was only with that cupola that we experimented with the outside tuyers."

Mr. Moore: "The results you have stated have been accomplished with the use of both the center blast and the outside tuyers?"

Mr. West: "We did not try the big cupola with the center tuyer."

Mr. Moore: "You would not, I take it, have felt you had blast area for the center tuyer in your large cupola."

Mr. West: "No, I do not think it advisable, for two reasons, to use only the center blast. It is well to distribute your blast as much a possible."

Mr. Moore: "I think without doubt a new principle has been discovered, but there are one or two things which have come to me and I presume you have thought them over. I have seen in connection with the Colliau cupola a great deal of burning out. I have also noticed above the upper tuyers, or about the top of the upper tuyers, holes burned in the opposite sides. The old McKenzie cupolas were quite free from this trouble. I have just wondered if it were caused by the blast being forced across the cupola. There is another question I would like to ask, and I presume you can give some light upon it. This tuyer, as the drawing indicates, is between your lower and outside tuyers and the upper tuyer openings—an intermediate position. That there is great economy to be obtained by the re-conversion of carbonic oxide into carbonic acid gas is certainly true. In the formation of carbonic acid gas there is an immediate change from carbonic acid to carbonic oxide as soon as the blast has left the lowest point of contact with the fuel. The whole tuyer area of your cupola is below the melting zone. I have understood that the formation of the carbonic oxide was in the incandescent fluid above the melting zone. I do not state this as a fact but as I understand it."

Mr. West: "In regard to the holes I cannot agree with the gentleman, that they are caused by the force of blast from the opposite side of the tuyers. I think it is simply a chemical action. The cupola I used for my experiments was 44 inches in diameter, and I put in upper tuyers, about four of them, about ten inches above the lower tuyers. I found in experimenting, that when the blast was cut off you could hardly get near the charging door. The men in charging would throw their iron in and jump back. We opened the upper tuyers and the flame would die down. You mention that you thought the carbonic acid was converted into carbonic oxide above the melting zone. The tuyers were below the melting zone, and it does seem reasonable that it was there that the change would have taken place—below the melting zone. We could melt the iron more quickly by using the upper tuyers than without them. Where you use the upper tuyers you seem, as it were, to have two melting zones."

Mr. Moore: "I would like to ask if any of the other gentlemen have had trouble with the cutting out of the lining opposite the tuyers."

Mr. Widdowson: "I took charge of a foundry in Mankato, about 18 months ago. It was lined about thanksgiving time and again at Christmas I lined it up again. We took on four heats in the furnace and it showed a red spot behind and in front, about 14 inches in diameter. I was afraid it would collapse. The men were disgusted and quit, and I had no time to see about it. I ran it with the same lining about eight months, and think I could have done so longer. The first thing I did was to reduce the blast and shut off half of the tuyer area. I think we use too much blast in cupolas. It has been my experience."

Mr. Moore: "I am inclined to agree with Mr. Widdowson that we use to much blast. I learned a year or two ago down in St. Louis that they had stopped using Connellsville coke and were using soft coke. In our work we have to use a great heat, for we have to have our iron hot or we have no show."

It was moved and carried that a vote of thanks be extended to Mr. West for the admirable and interesting paper which he had presented to the Association.

The meeting then adjourned.

ORGANIZING A MACHINE SHOP.

When business is brisk there is among manufacturers a general complaint that it is impossible to secure a sufficient number of good, well trained machinists. The majority of those whom we do find in American shops are Scotch and Germans. In all probability it will continue to be difficult to obtain efficient machinists until children cease to rule their parents, and are trained to do as they are told, and not to fear work. There is much to be said against the old-time method of binding a boy to a seven years' apprenticeship; but there is fully as much to be said in its favor. At present, however, the best apprentices and those who do their work most willingly and faithfully, are the graduates of technical schools, who see in that method of training a foundation upon which to build. Still, experience is a good teacher, and it may not be amiss to give someof my own. About three years ago I was called upon to locate the tools and organize the working for a machine shop in which a special line of work was to be done, the output to go into railroad service. The shop was located at some distance from the centers of trade, and its erection was the result of my represeation that in a shop of their own the company could manufacture articles for their use at a cost of only fifty per cent. of what they were paying to an outside concern.

As the work of installation approached completion, the president and I had many arguments in regard to the corps of workmen to be employed. The president wanted to engage a number of skilled, high priced men, whom he expected to bring from New York. I said: "No, the saving cannot be effected in that way."

During the course of my work I had applications to give employment to probably every unemployed man in the town. At first I took all who came; I then began to sift them, discharging one and hiring another, until, at the end of a fortnight, I had gathered in about a dozen of the most reliable and faithful day laborers in the town. Meanwhile I had been casting about for a working foreman, and finally lighted upon a German, who could do almost anything, and do it well. I superintended personally the setting of each machine, and the hanging of the shafting, using two of my brightest men for this job. Although neither of these men had ever befor done a stroke of such work, yet better running shafting was never seen.

One day, as the first lathe was being placed on its foundations, I laughingly asked my best man how he would like to "run her." It was pathetic to see the expression in the fellow's eyes. "Ah, Mr. ——," said he, "I never had a chance to learn; there's no show for me now, I'm too old." He was about thirty. "Well," I replied, "if you will do as I tell you, I will give you a show." So, on the next morning a piece of work was swung into the machine; I showed him how to grind and set his tools, and started the machine, giving him instructions not to do anything except run off the belt, unless I was there. I kept him merely looking on for a couple of days, then he sharpened his own tools, then set them, then set the roughing cut, then the finishing cut, and by the end of a week he could do, as well as could be asked, the special work for which the machine was intended. I followed the same plan with each of the other machines as rapidly as they were located, and, in three weeks from the time of the starting of my first machine, I had a dozen laborers running machine tools, and doing it satisfactorily. They were not afraid of big cuts and high speed, because they knew nothing else, and work was rushed through with marvelous rapidity.

How about wages? Well, I paid these men one dollar and a quarter per day as laborers; and, as their skill in the use of the tools increased, I slowly increased their pay from this to one dollar and fifty cents and one dollar and seventy-five cents per day. This was more than they had ever earned before, and more than they could possibly get elsewhere, so they were content. Two well-trained machinists served to keep tools and machinery in order, besides doing the fine finishing required.

But I was balked in my good intentions toward apprentices. As soon as I let it be known that I would employ three or four, I had innumerable applications. The applicants came accompanied by fathers, or mothers, or sisters, or brothers,

with and without references, and all were eager to begin to work and to learn. The daily pay was to be fifty cents for the first six months; sixty, the second; seventy-five, the third; ninety, the fourth; a dollar, the fifth, and a dollar and a quarter the sixth—thus ending a service of three years.

The entrance to the shop seemed paved with good intentions. There was no sweeping out for the boys, and they were set at work at once on the dull press; but the weary grind of ten hours a day proved too much for fickle Young America. Not one stayed longer than six weeks, and, indeed, some dropped out at the end of the second day. They didn't think they would like the machinist's trade; there was no chance to learn anything in that shop; mother thought the work was too hard—and so on, "with one accord, they all began to make excuse."

The inducements to apprenticeship did not work; but the laborers stuck to their tasks, performed them well and were content. I do not claim to be the originator of the method, for I have seen departments of big concerns running without a machinist in sight; but I cite this instance as showing what can he done in the way of the economical production of a standard article by training intelligent laborers to do one special piece of machine work, and by watching to see that they do it just as they are told.—[J. H. Allen in Dixie.

MILLS start up and shut down and start up again—you cannot tell how long their runs will last, and there is very little use in keeping tab on them. Some are steady goers, such as Jones & Laughlins and the Homestead, but generally the mills start up on limited orders and shut down when these orders are filled. There is no stocking up. The press telegrams are misleading; they tell of resumption usually in exaggerated form, and do not tell of the same mills closing after the brief runs that are habitually made. Unquestionably there is improvement from week to week, but this is gradual, and probably will remain at this gait until normal production is reached. We advise men notto travel far for jobs on the strength of newspaper reports. Wait for verification, and get an idea of whether the start-ups amount to more than the mere filling of small orders.—[National Labor Tribune, Pittsburg.

A JOLIET, Ill., dispatch says: The officials of the Illinois Steel Co., and the Amalgamated Association have come to a settlement regarding the wages to be paid at the mills here. The scale will be 11 cents an hour for the day laborers and 33 per cent. reduction on the tonnage, which employs about 40 men, the scale to hold for one month. There is enough pig iron in the yards to last four months, so that it will not be necessary to fire the blast furnaces. The rod mill converter and billet rolling mill will start up Nov. 1, giving employment to 1,000 men. The Illinois Steel Co.'s mills have been closed down since last December.

JUDGES appointed by the officials at the World's Fair at Chicago have made awards to the Joseph Dixon Crucible Co., Jersey City, N. J., for superior products in graphite, lead pencils, plumbago, crucibles, black-lead stoppers and nozzles, dippers, bowls, foundry facings and lubricating graphite. The Dixon Company is known throughout the world as the pioneer in the graphite industry and the United States Government in its bids for supplies calls for "Dixon's, or equal."

MR. KENNETH TORRENCE, M. E., formerly connected with the Chicago office of H. R. Worthington & Co., has opened an office in room 1437 Monadnock Block, Chicago, where he will carry on the business of a consulting mechanical engineer, and conduct an agency for the sale of the Snow pump, made by J. H. Snow, Buffalo, the goods manufactured by the Hendrick Mfg. Co., of Carbondale, Pa., and the Duval metallic packing.

THE Kilbourne & Jacobs Mfg. Co., of Columbus, O., have received from Rice, Barton & Fales, of Worcester, Mass., an order for five of their core-oven carriages, which are so designed as to overcome the difficulties connected with withdrawing the carriage from the oven after the heat has burned away all the lubrication of journal bearings.

THE EMPLOYER NOT ALWAYS LIABLE.

A case of more than ordinary interest to employers and employees in West Virginia, was tried at the last term of the circuit court of Ohio county, West Virginia, before Judge J. J. Paull. The facts briefly, were these: A man by the name of Michael Moylan was engaged in pushing a truck loaded with pipe in the Tube Works of the Riverside Iron Works, at Benwood, when one of the boards in the floor over which the truck was passing suddenly broke, causing the truck to nearly turn over. Several pieces of pipe rolled from the truck and fell on the plaintiff, breaking one of his legs. Moylan brought suit for $10,000 as damages. Evidence having been presented showing the above facts, The Riverside Iron Works asked the court to exclude the evidence of the plaintiff on the ground that it was not liable for an injury caused to any of its employees by the breaking of a board in the floor of its tube works or from any defect in its machinery, unless it was shown in addition to the mere breaking of the board or the defect in the machinery complained of, that it knew the board or machinery was defective, or ought to have known of it, and that the plaintiff, Michael Moylan, had not equal means of knowledge; the court sustained the motion of the Riverside Iron Works and the jury under its instruction, found a verdict for the company. The result of the above case is, that the court holds that an employer is not an insurer of employees against jury while they are working in his service and where an injury results, that the burden of proof is upon the employee, not only to show that an injury has come to him while so engaged, but he must further show by affirmative proof, besides such injury, negligence on the part of the employer, before he is entitled to recover; and negligence in such a case would mean a defect which the employer knew of, or ought to have known of, without equal means on the part of the employee of knowing of the same.—[Ohio Valley Manufacturer.

THE Lodge & Davis Machine Tool Co., of Cincinnati, O., have lately received orders from the Government for machine tools for the navy yard in Washington, D. C., another order from Germany and one from the Big Four railroad for its machine shops in Bellfontaine, O. The order from Germany is from a large sewing machine manufactory, employing 500 hands. It is gratifying to note that here and there manufacturers of machinery and tools are receiving some very large orders, and that those in Cincinnati are not behindhand in making their machinery known, both at home and abroad.

THE Henry R. Worthington World's Fair medals are for large check and foot valves for water works purposes, air compressor and air pump, horizontal expansion engine, four cylinder vertical triple expansion engine, vertical compound engine, underwriters' fire pumps, low duty pumps, Admiralty feed pumps, automatic feed pumps, wrecking pump, independent jet condenser and pumps, pressure pumps for mining and elevator service, ammonia pump, duplex water motor, steam accumulator combined with duplex pump, and general exhibit of pumping machinery.

IN a recent issue of this paper attention was called to the exhibit of Penberthy injectors in Machinery Hall at the Columbian Exposition. Information has since been received that the judges have awarded to this injector the medal for merit. During the six and a half years it has been on the market, nearly 75,000 have been placed on boilers in all parts of the world, and wherever they are used they have given perfect satisfaction. They are manufactured by the Penberthy injector Co., of Detroit, Mich., who are to be congratulated on the success they have achieved.

THE Cincinnati Milling Machine Co. are making a large shipment of milling machines and universal grinders to fill an order from Germany. Business with them is reviving and they now have quite a large force at work and think conditions will so improve as to keep them busy for the rest of the year. As noted from time to time in these columns, they have had a goodly number of orders from foreign countries for their machines. Several improvements have have been made in them of late, adding much to their value.

NEW CENTER BLAST TUYER AND ITS ECONOMICAL ADVANTAGES.

BY THOS. D. WEST.

[Read at the Meeting of the Western Foundrymen's Association, at Chicago, Oct. 18.]

It is a question if in any of the industrial arts there has been so little improvement in the last forty years as in the cupola used for melting cast iron. It is not owing to the lack of effort toward improvement, for we find that there has been untiring energy and much capital expended in experimenting with different forms and principles in cupola construction, to reduce the ratio of fuel to iron, or, practically speaking, the cost of melting. Today it is a point open for dispute if a better understanding of the science of "running a cupola" has not had as much to do with its economical operation as any improvements in the construction of cupolas.

I think it will be admitted that little or no radical advance had been made in management until the advent of practical writings upon the melting of iron. As the chief pioneer in this we should all bow with respect to Dr. Edward Kirk, author of "Founding of Metals," a work published in 1877. Without a positive change in the principles of melting and construction of cupolas now in use, I do not see how it will be possible to make any greater advance in the matter of economy, which now means, according to the conditions of requirement, the use of one pound of fuel to melt from five to ten pounds of iron. I think it is now thoroughly understood what is true economy in the use of fuel, and why the same intelligent melter might be required to use one to five in one case, where one to ten would answer in another.

With our present methods, one field now presenting itself for the acquisition of knowledge in matters of melting and cast iron is in the chemical action taking place in the remelting of iron. I have been greatly interested in the papers and discussions emanating from this organization upon the question of chemistry, and think the subject of the utmost importance to many foundries. There are those that can get along without having chemical service, but they are very few who could not obtain practical benefit from a use of the knowledge now obtainable upon the question. I know that in the ingot department of our foundry we could not afford to abandon chemistry. Not only do we know the chemical qualities of every charge of iron that goes into our cupola, but also that of the coke. When running full, our heats range from fifty to seventy tons per day, and the product is analyzed and a record kept, so that we are enabled to ascertain if anything is going wrong and chemically compute what goes in and what comes out of the cupola.

The adoption of chemistry in our foundry was not a question of choice. We were compelled, from self-defense, to know what our product contained, as we found our customers often attributing short service in particular moulds to excessive silicon or sulphur, when it was plainly not due to these causes. To protect ourselves against claims of this nature, as well as to insure uniform analyses, we found it necessary to know not only the analysis of our pig iron, but also of our product. Comparison of analysis with service naturally followed, which in time resulted in a somewhat elaborate system of records. It might be advisable to state here that in our practice we use all pig iron, and that such practice gives an advantage for obtaining reliable data that foundries purchasing scrap to mix with pig metal could not secure as readily. Generally speaking, purchased scrap iron is a miscellaneous collection of everything, and to attempt to know its chemical composition would generally involve so much labor and expense as to make it impracticable. With some scrap piles, by taking several samples and mixing their drillings, so as to obtain an average, an analysis might often work very fairly; but such a case would be the exception to the rule. It would be best in such cases, when special results are desired, to abandon the use of scrap and use all pig iron.

The president of our company, Mr. Geo. H. Boyd, has formulated quite an elaborate system for recording the chemical and physical qualities of our irons and product coming from it. The way the subject is classified enables us to obtain some very valuable data. As an illustration we will take up the question of silicon and sulphur. Here we find, by remelting or by the action of the fuel and blast in the cupola, that we reduce the silicon from one-tenth of one per cent. to four-tenths of one per cent., but this reduction is generally uniform. We think it is only through some radical change in manipulating the blast to the cupola it is caused to be reduced below two-tenths of one per cent. On the other hand, we will increase the sulphur one time two-tenths of one per cent., and perhaps the next five-tenths of one per cent., when using coke of same analysis and in uniform ratio to iron charged. The manipulation of the cupola alone seems to affect the sulphur to a greater degree than the silicon, for the silicon is generally reduced uniformly, while the sulphur seems to have no regularity about its increase; and I am inclined to think the varying temperature existing at time of melting is the main cause of the irregularity found in the sulphur when same coke is being used. The Connellsville coke we use will average 0.80 in sulphur; the iron 1.50 silicon, .040 sulphur, manganese 0.34, phosphorus .092. The analyses of the above materials are given so as to enable any one that might be inclined to do so to take the matter up and compare notes with us.

There is a large field for investigation in chemical matters for the founder to explore, and the information to be obtained will enlighten us upon many mysteries we now find ourselves at a loss to fathom. I do not wish it understood that we are wholly relying upon the chemical analysis of iron, for there is too much to be discovered in that line ere we can ignore the physical qualities of iron in judging of and attaining results. While cupola work is progressing in respect to chemistry, I think from my late efforts and results there will be further achievements in melting, barring what might come from the little explored region of electricity.

Before entering upon a description of my late experiments, I think a brief recital of different plans and principles that have been tried in various cupolas for the past 50 years would prove very beneficial in leading up to a ready understanding of the advantages the writer desires to set forth in illustrating the new principles which he has originated in experimenting with melting by means of what we will term a center blast.

An investigation of the experiments made in cupolas with a view to economy in fuel shows there have been many failures and we find most all plans imaginable have been tried. Europe far surpasses this country in originality and novelty of designs, but I question if America has not excelled in the points of good general utility. The first radical beneficial step we find to have taken is in the adoption of the "drop bottom," an American invention. Ere this came in use, bottoms were composed of solid masonry or fire-proof material from the ground up to the spout and in order to get the "dump" or refuse out of the cupola after a heat was finished the "front breast," being made large, would be knocked out and by means of pokers the refuse and cleanings would be raked out. I am led to believe that this plan is still being used in some parts of Europe to-day. From the adoption of the "drop bottom," improvements have been mainly in the line of securing greater economy in the use of fuel. The most radical divergence from the common cupola has been caused by experiments in designs arranged as in the Woodward cupola which sought, to create a blast economically by means of a steam jet blowing up the stack; also as in the Rirger cupola, which instead of forcing the blast upwards reversed the order; then, again, as in cupolas arranged to utilize gas for a fuel. In examining some of the cupolas that have been tried one would surely think that if crooks and oddity had any virtue, perfect combustion would have been accomplished long ago. This may be secured, but we find more founders have faith in the common cupola. My definition of common cupola is one of plain cylindrical form having one or more rows of tuyers. The question of inside formation and illogical shapes given to cupolas have about ran their course of absurdity and this has been helped by late literature upon melting. We are rapidly advancing in understanding the principles and sciences involved in the proper construction of cupolas and melting, and to-day we find the only element of any value that has been grasped from out the chaos of ruined expectations in the construction of cupolas is that of economical combustion being attained by two or more rows of tuyers. In order that all may be able to follow this paper intelligently and understand the philosophy and advantages

to be gained by "upper tuyers" we will first note the action of fuels in order to obtain perfect combustion. "According to Dulong 1 pound of carbon combining with the necessary quantity of oxygen to form carbonic acid develops 12,906 units of heat. The specific heat of cast being about 13, the melting point 2,190 degrees, and the coke containing 82 per cent. of carbon, then to heat a ton of cast of a temperature of say 40 degrees to a temperature of 2,190 degrees, would require $\frac{2150 \times 2240 \times .13}{12906 \times .82} = 59.1$ pounds coke. This is supposing that the whole of the carbon is converted into carbonic acid, but if by any means carbonic oxide is formed a very different result is obtained; then one pound of carbon to carbon oxide only evolves 4,453 units of heat. If however by admitting air above the zone where the oxide is formed we recover 4,478 units this times 4,453 gives 8,931, which is a little over two thirds of the available heat to be gotten out of one pound of carbon, allowing ten per cent. for moisture in the coke, ten per cent. for radiation and 20 per cent. for loss of heat passing off at the top of the cupola or 40 per cent. in all, the amount of coke per ton of metal should not exceed 112 pounds although the actual consumption is as we have shown usually much higher."

The combination of carbon with oxygen or air blown through the "lower tuyers" produces carbonic acid gas in the bottom bed of fuel and this in passing up through fuel heated to incandescence takes up more carbon and is converted into carbonic oxide gas. Now if the carbonic oxide can again have sufficient oxygen or air admitted to it we will again have carbonic acid or more nearly complete combustion and by such alternate zones which at every repetition become less volient, we could if it were only practical to hit the right spot of the descending stock with the proper amount of air, almost achieve the theoretical figure of melting one ton of iron with 59 pounds of fuel as given in above table; but instead of that we consider if we can accomplish such with 200 pounds of fuel we are doing exceptionally good work.

We have cupolas figured to achieve the above results by combination in tuyers and in reality cupolas having two or more rows of tuyers can be the only ones properly entitled to the claim of being scientifically constructed as far as the admittance of blast is concerned. Were it only possible for the blasts passing through their tuyers to penetrate to the center of the cupola and have an immovable zone of fuel to play into, they might successfully accomplish the end intended, but as it is, the results are but partial; it is a question if the extra burning out of the lining which two or more rows of tuyers cause by having more melting zones does not often more than compensate for what saving in fuel may be acquired.

The economy that is possible if two or more rows of tuyers could only be made to force its blast to the center of the cupola and at the right elevation, caused me two or three years ago to give thought to the subject and to desire to get nearer the theoretical figure than present cupolas were doing if it could be possible.

One plan after another suggested itself until the idea of a center blast came to me. Having two cupolas in our shop, I thought I would experiment with the smaller which is 40 inches inside diameter. Cutting a round nine-inch hole in the "drop doors" we attached to the under side when the doors were propped up, an eight-inch blast pipe. Inside the cupola and resting on the "drop doors" was placed a cylinder eight inches diameter by eighteen inches in height on the outside of which were prickers protruding about one and one-half inches so as to support a lining of clay. On top of this cylinder was placed a clay cap supported by three pieces of fire brick so as to leave an opening two and a half inches high for the admittance of the blast. The outside tuyers were all stopped up and all the blast admitted to the cupola up through this center cylinder tuyer. The first heat was carried through with the same fuel as used with the old system of outside tuyers and resulted in giving hotter iron melted in about the same time. Several more heats were run off reducing the fuel each time and still giving iron hotter than with old system. The most astonishing feature of the experiments was the little or no burning out of the cupola's lining. In fact the process seemed to cause a glazing effect that was beneficial to the lining.

The experiment in this small cupola resulted so favorably that we concluded to try the plan in our large cupola in connection with the outside tuyers, which we did after the plan illustrated by the cut herein shown. Before starting in to use this bottom center blast tuyer, we were not safe in trying to do better than one to seven or eight in fuel, as our metal came all from pig iron and had to "come down hot." With the combination of the center blast and outside tuyers we found we could obtain hot metal with one to ten or eleven, and I would state that the one to ten and eleven iron was often much hotter than the one to seven or eight melted with the old process, and it would often come so hot it would take considerable scrap to cool it off before it would be wise to pour the metal. To say it would be as hot as stove molders would often care to use it would probably be the best way to convey an idea of its heat, and it might be well to state that the metal would be hotter at the end than at the beginning of the heat. The cupola men liked to use the device, as it made the work of chipping out and daubing up the cupola so much easier than

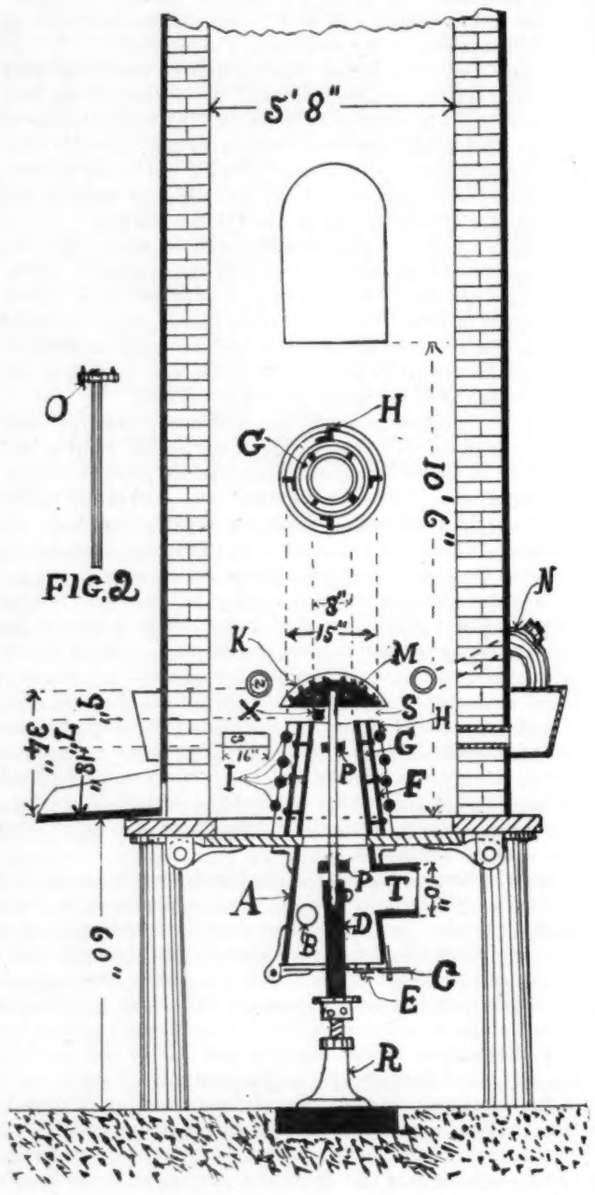


FIG. 2

WEST'S CENTER BLAST TUYER.

in the old system, for in fact there would often be very little of such work to do. In my experimenting there were several plans tried, but the one recommended later on is the best and last one I am using with this system. It cannot but be evident that with such a plan the blast is conveyed to the center of the cupola or body of fuel, where it should be to achieve the greatest results, and if the theoretical point in perfect combustion is ever to be reached it will be by some such system. Not only does this plan save fuel, but also the lining of cupolas, while the present methods or principles now used for accomplishing economy in fuel do so at a sacrifice to the lining; so much so as to make it in many cases a question if there is any economy in using "upper tuyers."

I know there are those that will wish to criticise the plan here presented, and say that had we used "upper tuyers" we would have accomplished the economy in fuel which we did with our new system. To all such I would say that by looking at the cut at N herein shown they can see that such was used, for the cupola as now shown is, as far as outside tuyers are concerned, used the same as when we could not do better than one to seven or eight. I know we read about melting one to ten or eleven and up as high as sixteen. I only wish to say that by the adoption of the plan here presented they should still do better, and not have what they save in fuel lost by cutting out the lining. No doubt many can from a glance at the drawing conceive at once the whole scheme of the plan, but I think most all would prefer a detailed description of the working of the system. A is an outside tuyer box made of one-quarter-inch wrought boiler plate, so as to make it light for dropping purpose. It is bolted only to one-half or section of the "drop doors." B is a peep-hole, arranged with isinglass, for the purpose of seeing if all is working well. C is a hinged cover having a hole for the bar cap supporter D. At E is a one and one-quarter hole stopped by a little pivot swinging valve, so that if through the peep-hole B any leakage should be seen, this valve could be swung back to let the metal or refuse run out. It will be noticed that the tuyere box A is made of a taper, so that should slag iron or refuse drop down into it, it could be readily relieved. The cylinder at F is made of an inner and outer ring of one-quarter-inch boiler plate. The space G is filled with fire clay. H shows angle iron, of which there are four pieces, for the purpose of supporting the round iron rings I. These and the angle irons are for holding and preventing the bagging of the fire clay, which is daubed on over them to protect the cylinder F from the melting heat of the cupola. This clay would be put on after the cylinder is placed in position inside of the cupola, and dried by the burning up of the bed. It would be the better plan to have two cylinders, so as to have one all the time on hand for drying in an oven. One heat gave us trouble through lack of care when half through by the metal getting through the clay to the iron rings. K is a clay cap having a cast iron prickered casting, as shown at M. The clay or ganister used for forming this cap K and daubing over the cylinder F should be of the best quality. The one and one-half inch bar shown at D is in two sections, so as to enable its being pulled out before "dropping the bottom."

In cases where cupolas stand high the bar might often be worked in one piece. In placing the cap K on the cylinder my first plan was to let it rest down upon it and then after the blast was on and the iron commenced to melt, the jack screw R would be raised, thereby lifting of course the bar H and the cap K to make any width of opening at S for the admittance of the blast that would be thought wise. The raising of this cap up against the pressure of coke and iron gave us trouble at one heat through breaking off of the clay at the outer rim of the cap, so that after the cast was about two-thirds over the heat in the cupola had melted the casting M so as to cause a leakage down into the tuyere. We then tried another plan by letting the cap rest on three pieces of fire brick one of which is seen at X, as done in the 40-inch cupola; these being equally divided the blast would have ample room to find space for entrance between the top of the cylinder F, and the cap K, as at S. In order to prevent the blast from entering this tuyere ere the iron commenced melting, we used a damper as seen at Fig. 2, which would be placed up in the cylinder F at a point about level with H and which consisted of a jointed bar the same as seen at D, having at its end a round piece of one-half inch boiler plate, as at O, having prickers riveted into it for the purpose of holding clay to keep the damper from getting hot and also bring the clay down when the damper would be removed or the blast allowed to enter the cupola. This arrangement of course did not require any jack screwing. We simply had the bar D protrude below the tuyere box cover G about two inches so that a swinging catch attached to this cover supported the rod D and in removing this damper we simply knocked the catch away and the damper fell down, bringing its clay with it. Of course, with arrangement of damper, the center supports or guides P P for the bar D, when the raising plan was used, were removed. This plan was a decided improvement over raisng the cap and worked all right. The reason for it not being desirable to admit the blast through the center tuyere ere the iron commenced to melt was, in the first place, to have the bottom outside tuyeres get the carbonic acid gas well started from the lower fuel before admitting oxygen to combine with the carbon oxide created in the fuel above the bottom tuyeres, upon the same principle that it is desirable to do so with upper outside tuyeres. In the second place it greatly aids in preventing the tuyere hanging up when the bottom is dropped, with very large heats.

The cap K, as shown, was made larger in diameter than the cylinder F so as to prevent the dropping metal from falling or getting into the opening at S during the heat. It will be noticed that the point of entrance for blast at S is higher than the bottom outside tuyeres. This is done to achieve the end accomplished by upper outside tuyeres in admitting oxygen to combine with the carbonic oxide in turning it to carbonic acid gas, thereby making more complete combustion.

In making connections for the blast with the center tuyere box A, conditions will vary the plan to be adopted. The attachable pipe coming to this tuyere and connected at T should be an independent one coming directly from the main blast pipe, and not from any of the side tuyeres or wind boxes, and a damper should be arranged in this main side branch pipe so that the pressure of the center blast can be regulated independent of the outside blast. The cupola shown has 12 outside tuyeres, six of them being lower tuyeres, 3″x16″, and six of them upper tuyeres, two inches in diameter. The width of opening for the center blast admitting of air was about 2½ inches. In "dropping the bottom" after very heavy heats we sometimes found that the center tuyere would hang up, but by a little rapping on its protruding end with bars it would come down, and leave a good "dump" or "bottom dropped cupola." In using this tuyere by itself or in combination with outside tuyeres it is essential in large heats to flux a cupola well and run the slag off. By letting slag remain in the cupola it readily chills around the tuyeres and thereby causes "bunging" or "hanging up," and it might be well also to state that the outside tuyeres should be kept well open so that the blast can find easy delivery to the end of the heat through them. At the start the blast should not pass through the center tuyere with any more force than necessary to counterbalance the inside wind pressure. The blast we use is delivered from a No. 9 Sturtevant fan.

If this system should be adopted in cupolas that are to run steady over ten hours, like those at steel works, I would like to hear of some one trying the cylinder F (instead of as here shown), having it constructed of all fire brick, every other course being tied with a thin plate of boiler or cast iron, the edges of which standing back, so as to be protected by a covering of clay. These rings should not be over 3-8 thickness. The idea is to make sure of the heat not causing any cracks to occur in the brick tuyere or burn the edges of the rings while the blast is on. By well tying the brick work or "breaking its courses" it might stand well without the use of the iron rings. I have tried an all fire clay cylinder tile baked in a fire brick kiln, but it did not prove a success, as it was cracked and gave us trouble from leakage. For ordinary cupola work, I know that with care and judgment the plan here illustrated, and having the two cylinders as above suggested, could be made to work successfully, and all who try it will find they can save fuel and the cutting of their lining. The latter with some firms is a very costly affair. Of course, in starting in to try this system one is not expected at the very first heat to charge with a radical change in using less fuel, but gradually trying less every heat until they find by trial just how low they can get. At the start you can at least depend on reducing the bed in bulk whatever the bulk of your center tuyere may occupy, and between charges have 20 per cent. less fuel. I know that in our 68-inch cupola we reduced the bed after trials from 3,000 to 2,100 pounds, and in charges from 900 down to 500. The iron we place on the bed is 8,000 pounds, and between charges 6,000 pounds, and, as stated in first part of paper, our heats run from 50 to 70 tons. We are still experimenting in this line, but as business has been so dull for the last three months, there has been but little opportunity to go ahead and compute the results. Before closing this paper I would like to say I think the ideas and principles of "center blast" presented above might also be well utilized for blast furnace smelting.

A remarkable coincidence in this experimenting is that after

I had been laboring with the new system, thinking the idea was alone with myself, a letter came from the far North showing that another foundryman was likewise experimenting —Mr. Thos. H. Widdowson, of Mankato, Minn., who wrote me on this subject after I had been at work upwards of a year. I have mailed Mr. Widdowson a notice of the reading of this paper and invited him to be present to discuss the merits of our respective operations.

INDUSTRIAL SUMMARY.

New Construction:—

At Ashland, O., Louis Sears is about to erect a foundry.

Haines & Harvey are building a new foundry at Gibson, Ill.

The J. I. Case foundry at Racine, Wis., has been torn down, preparatory to building a new one.

W. H. Jacobs, Bethlehem, Pa., is erecting a brick machine shop, three stories high. It will be completed by December 1.

The new meter house for the East River Gas Co. will be entirely of brick and iron. The roof trusses will be of iron covered with corrugated iron and glass and are designed and built by the Berlin Iron Bridge Co., of East Berlin, Conn.

Thomas Sully, architect of New Orleans, La., has ordered from the Berlin Iron Bridge Co., of East Berlin, Conn., an iron roof for a sugar house at Tampa, Fla. The building will be 60 feet in width and 125 feet in length, the trusses being entirely of iron covered with corrugated iron.

The contract for the Niagara Falls power house has just been awarded. The building will be 200 feet long by 64 feet wide and 40 feet high. The roof will be of iron and slate, the trusses of iron. This present building is only one section, and next year an extension will be added of 400 feet. The 10 turbine wheels to be put in will develop 50,000 h. p. The cost of this building is estimated at $100,000.

Additions, Enlargements, Removals, Etc.:—

M. Donovan, Toledo, O., is enlarging his foundry.

Rohlfing Bros. contemplate moving their foundry from Waterville to Elysian, Minn.

H. H. Harvey, of Augusta, Me., is breaking ground for an addition to his main shop, 36x40 feet, two stories high, and also one building, 20x80 feet, one story. He also contemplates building a foundry, 60x40 feet.

The West Virginia Central & Pittsburg railroad is making an addition to its shops at Elkins, W. Va., that will increase the capacity one-half. The building will be of brick and will be fitted with modern machinery.

Fires and Accidents:—

D. J. Bolenger's foundry at Waynesburg O., burned with $5,000 loss; insurance $500.

The adjustment of the fire loss of the Clinton Wire Cloth Co., of Clinton, Mass., gives the company $170,000 on buildings, machinery and stock. The new mill is expected to be ready for the placing of machinery Dec. 1.

General Industrial Notes:—

The Smead foundry at Toledo, O., has resumed after a long shut down.

Operations will begin at once at the Tonkin Boiler & Engine Works, Oswego, N. Y.

The Whiskey Island mill of the Lake Erie Iron Works, Cleveland, has resumed operations.

The starting up of the Belmont Nail Works in the Wheeling district gives employment to 500 men.

The Chattanooga, Tenn., Car & Foundry Co., are running in all departments and have a good number of orders ahead.

At Muncie, Ind., the Whitely Harvester Works and the White River Iron & Steel Co. were booked to start up this week.

Andrews Bros. Co., of Youngstown, O., have shipped 2,000 tons of their "Haselton" American-Scotch pig iron within the past month.

The Stillwell-Bierce & Smith Vaile Co., of Dayton, O., have declared a dividend of 2 per cent. on the preferred stock, payable Oct. 16.

The Penn Iron Works at Lancaster are reported in dispatches to have closed down for lack of orders. They employed 350 men.

From the Ferracute Machine Co., of Bridgetown, N. J., the report comes of an improvement in orders, with an apparent betterment of trade prospects.

The Whitely Malleable Iron Co., of Muncie, Ind., have a contract from the Jeffrey Mfg. Co., of Columbus, O., for the manufacture of 3,000 tons of endless chains.

At Muscatine, Ia., the Williams Rolling Mill, a new enterprise started by the local improvement company has rolled its first iron. About 200 skilled workmen will be employed.

The Girard Stove & Foundry Co., organized to take hold of the Girard, O., stove plant, have made their first cast of stoves, and a successful one. The plant is fully equipped for good work.

The Latrobe (Pa.) Steel Works, whose product is high grade locomotive and car axles, have been in continuous operation since they were built in 1889. Reports of employes discharged and of an indefinite shut-down are incorrect.

The sheet mills having given notice of 10 per cent. reduction are: New Philadelphia Iron & Steel Co., New Philadelphia, Ohio; Ætna-Standard Iron & Steel Co., Bridgeport, Ohio, and Geo. W. Johnson, New Castle, Pa.

The Berger Mfg. Co., of Canton, O., manufacturers of sheet metal roofing, etc., have just started up their new buildings, with a force of 120 men. The new sheet metal building is 65x602 feet, stamping department 40x60 feet and paint shop 40x320 feet.

W. F. & John Barnes Co., of Rockford, Ill., manufacturers of machinery and mechanics' tools and supplies, report an increase in orders and a larger inquiry for prices. They have been running at half their full capacity, but have recently added quite a number of men.

The mills in and around Pittsburg are operating but to a small extent. Our correspondence shows the mills in the Seventh district to be almost entirely idle, and in the various other districts only a small amount of work is being done.—[National Labor Tribune, Pittsburg.

A new foundry enterprise in the Pittsburg district that will go ahead when the business outlook justifies, will enlist a considerable amount of capital and have for its equipment the most modern appliances. The site will be in some one of the manufacturing towns close to Pittsburg.

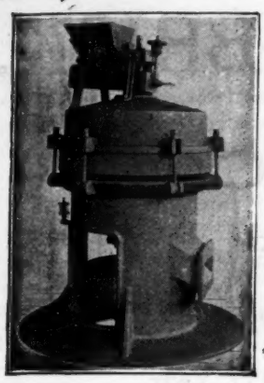
The Babcock & Wilcox Co. have just completed putting in two batteries of their well-known water tube boilers at the Jefferson Iron Works at Steubenville, O. The combined total horse-power is ranked at 500, but they are capable of generating 650 horse-power. Waste gas from the furnace will furnish the fuel, and some improved methods of handling will be used.

At this time last year the Baldwin Locomotive Works at Philadelphia employed 5,890 men, many of them on double time. Now but 2,480 are employed on half time. But from three to five locomotives a week are now being built, and these are mostly on foreign orders. Last year the output was 20 to 24 a week. Some of the departments are closed altogether and there are but few orders ahead.

Since the blast furnace at the Jefferson Iron Works, Steubenville, O., was blown out it has been newly relined with all the improved water cooling and other arrangements demanded by modern practice. The stacks have been repainted and overhauled, new and improved facilities provided for fuel consumption and the various forms of transportation of product about the mill brought down to the standard of the latest improvements.

Nearly all of the Ætna-Standard plant is now going and the company is prepared promptly to fill all orders. In the Ætna department all of the bar mills and two sheet mills are in operation. In the Standard department the entire works are on full, including the galvanizing and corrugating works. This leaves four sheet mills in the Ætna department as the only part of the big plant now idle. Business is not booked ahead so far now as is usual at this time of the year.

At Detroit last week bids were opened by the board of water commissioners for 3,500 tons of pipe ranging in size from four to 16 inches, inside diameter. The following bids had been presented: Lake Shore Foundry Co., of Cleveland, $19.45 per ton delivered in Detroit; Addyston Pipe & Steel Co., of Cincinnati, $19.80 per ton delivered; Dennis Long & Co., of Louisville, $20.39 per ton; Howard Harrison Co., of Bessemer, Ala., 2,000 tons at $19.20, and 1,500 tons at $21.20. The bid of the



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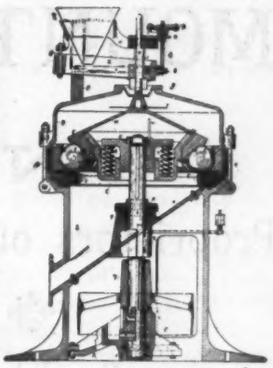

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Cleveland firm being the lowest it was given the contract. The total amount will be $68,075.

The New Castle Steel Mill has made some very large outputs of finished billets in the past, but recently it made a record. During the two turns on one day the total output of billets was 535 tons. This amount of finished metal would look large to the average man when he remembers that it was all made in a single mill in 24 hours. An ordinary freight car will carry about 25 tons, therefore the steel made in one day at the steel mill will load 22 cars. Each ingot weighs about two tons. To make 535 tons of billets about 268 ingots would have to be rolled during the day. This would average nearly 12 per hour, or one every five minutes. Thus the production of the New Castle Steel Mill is about one ton of billets in 2½ minutes.—[New Castle, Pa., Guardian.

The Carnegie Steel Co., which employs altogether 12,000 iron and steel workers, is operating all its plants about two-thirds full. The work is divided so that all the employes get a share of it. The American Iron Works are running steadily, as are Park Bros.' Black Diamond Steel Works, the Porkhouse mill, the Hainsworth Steel Works, the Duquesne Steel Works, Lindsay & McCutcheon's Allegheny mill, the Sligo and Clinton mills and part of the Republic Iron Works. In addition to this, a number of large sheet mills are in operation. Secretary Lovejoy, of the Carnegie Steel Co., said yesterday: "The reason for the lack of demand in the iron and steel market lies in the fact that consumers expect lower prices as a result of the probable reduction in the tariff. We are making no sales of any extent at present for this reason."—[Pittsburg Dispatch.

The New Castle Tin Plate Mill went into operation last week, and plates ready to be coated with tin were turned out. The first step toward the manufacture of tin plates having been successfully accomplished in New Castle by the rolling of the black plates at the immense new plant, one of the finest in the world, nothing further remains to insure the success of the great new industry, but the dipping or coating of these black plates, and with the splendid machinery and skillful workmen that have been employed, there can be no doubt whatever of the ability of the New Castle firm to turn out tin plates equal to any of foreign manufacture. The steel that is to be used by the New Castle Co. is now being shipped from Pittsburg, but after a short time will be made at the Shenango Valley Steel Mill. The officials of the New Castle Steel & Tin Plate Co. and all others were well pleased with the way the machinery worked, and in the examination of the black plates made showed that they were of an extra good quality, there being scarcely a speck or a flaw in any of them.—[New Castle, Pa., Guardian.

WORLD'S FAIR EXCURSIONS.

$10.00 Round Trip to Chicago from Cleveland Via the Pennsylvania Lines Every Day.

Children under 12 years of age, one-half the above rate. Commencing October 19th, Special Excursion Tickets to Chicago at the above reduced rates will be sold daily during the progress of the great Columbian Exposition from Cleveland, and at corresponding low rates from other intermediate ticket stations on the Pennsylvania Lines. The Special Reduced rate tickets will be valid only in the Pennsylvania Standard Coaches on all regular trains carrying day coaches. Return coupons will be valid ten days from the date of sale in coaches of any regular train scheduled to stop at their destination. All through trains to Chicago over the Pennsylvania Lines run to the Union Passenger Station on Canal street, between Adams and Madison streets and stop at South

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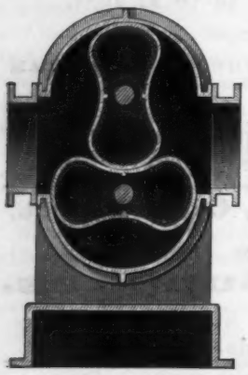

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Pennsylvania Railroad's Plans for Fire Protection.

Immediately after the destruction by fire in December, 1890, of the Pennsylvania Lines' freight station at Cincinnati, involving a loss to that company of over $100,000, the company entered heartily into the subject of fire protection, and the most effective appliances and devices were adopted to reduce loss by fire to the minimum. An arrangement was made whereby all the company's property was periodically inspected, and required to be kept clean and in good order. All old waste and inflammable material was very carefully disposed of. Fire extinguishers were purchased and it would seem that every possible means was adopted for preventing a similar disaster at any point. Wherever watchmen were employed it was decided to place watchman checks so that evidence would be at hand to show whether the watchmen performed their duties. A committee was appointed from among the officers of the Pennsylvania lines west of Pittsburg (northwest and southwest) for the purpose of investigating the merits of watchman's time detectors. This committee was composed of Mr. E. B. Wall, assistant to first vice president P. C. C. St. L. R. R. Co., Chicago, Ill.; Mr. F. C. Darlington, superintendent, Indianapolis, Ind., and Mr. A. M. Schoyer, superintendent telegraph, Pittsburg, Pa.

Samples of all reliable time detectors were examined and representatives from the various manufactories appeared before the committee. When this committee submitted its report it was found that they were unanimously in favor of the Pneumatic Watchman Check which is manufactured at Columbus O. A large number of these checks were already in use by the Pennsylvania lines east and west of Pittsburg, but no official action had been taken up to that time toward adopting a standard. The Pneumatic Watchman Check is also largely in use by the N. Y., C. & St. L. R. R., the P. Ft. W. & C. R. R., the C. & C. T. R. R. and many large systems in the United States. Mr. A. M. Schoyer, supt. of telegraph, being an expert electrician and therefore thoroughly familiar with all the ways in which electrical and mechanical checks may be cheated, especially preferred the Pneumatic Check on account of the impossibility of the watchman cheating it and its extreme simplicity of construction. The rate of insurance on property is reduced wherever these checks are in operation, and its users are strong in their support of it.

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Will be run every day, commencing Oct. 19th, via the popular Nickel Plate Road.

One Fare Every Day.

Commencing Oct. 19th and continuing until Oct. 31st, the Nickel Plate Road will sell excursion tickets to Chicago and return at rate of one-fare for the round trip. Tickets good on all trains and good returning ten days but not later than Nov. 5th, 1893.

For the Last Days.

Commencing Oct. 18th, and every day thereafter to Oct. 31st, the Valley and B. & O. Rys. will sell excursion tickets to Chicago and return at one fare; good ten days. Tickets sold on and after Oct. 27th will be limited for return to Nov. 5th. City office No. 143 Superior st. Depot foot South Water st.

The Last of the World's Fair.

The Exposition will close Oct. 31st. During the last twelve days of the World's Fair the Nickel Plate Road will run one-fare excursions every day.

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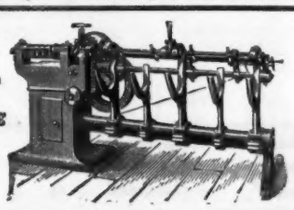

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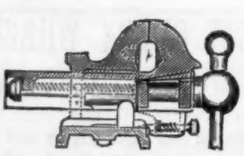

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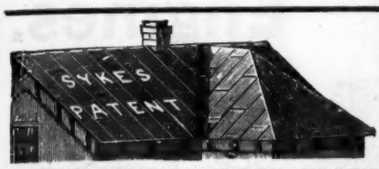

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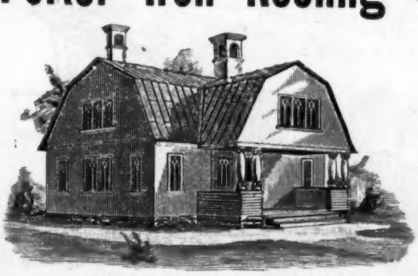

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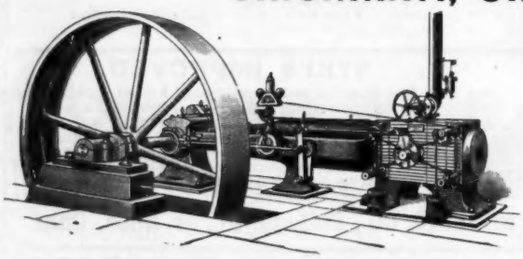

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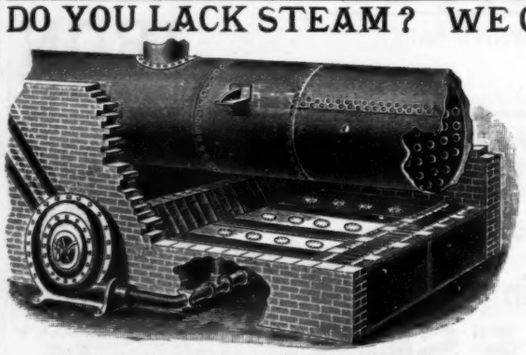

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Fidelity & Deposit Co., Baltimore, Md.
Geo. Pemberton, New York.

Iron Filler—
W. W. Lawrence & Co., Pittsburgh, Pa.

Iron Ore, Bar and Pig Iron—
Oglebay, Norton & Co., Cleveland.
J. H. Outhwaite & Co., Cleveland.
Condit-Fuller Co., Cleveland.
E. C. Pope, Cleveland.
Cleveland Iron Mining Co., Cleveland.
Corrigan, Ives & Co., Cleveland.
B. M. Jones & Co., Boston and New York.
Wilhelm & Co., Harrisburg, Pa.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Porter Iron Roofing & Corrugating Co., Cincinnati, O.
Curtis Steel Roofing Co., Niles, O.
J. H. Eller & Co., Canton, O.
N. A. Haldeman & Co., Philadelphia, Pa.

Iron Working Tools—
John Adt & Son, New Haven, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Cleveland Twist Drill Co., Cleveland, O.
Cleveland Stamping & Tool Co., Cleveland, O.
Cincinnati Milling Machine Co., Cincinnati, O
Hill, Clarke & Co., Chicago, Ill.
Higley Sawing & Drilling Machine Co., New York City.
Prentiss Tool & Supply Co., Chicago, Ill.
A. P. Quint, Hartford, Conn.
Toledo Machine & Tool Co., Toledo, O.
Whitman & Barnes Mfg. Co., Akron, O.

Iron Nails and Steel—
Weber & Co., Cincinnati, O.
G. B. Schulte Sons Co., Cincinnati, O.

Iron and Steel Wire—
Trenton Iron Co., Trenton, N. J.

Lathes—
Prentiss Tool & Supply Co., Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.

Ladles—
Detroit Foundry Equipment Co., Detroit, Mich.
The S. Obermayer Co., Cincinnati, O.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.

Lubricators—
Eagle Lubricator Co., Cleveland, O.

Machinists' Tools and Supplies—
Cincinnati Milling Machine Co., Cincinnati, O.
Hill, Clarke & Co., Chicago, Ill.
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Spicer Mfg. Co., New Philadelphia, O.
Harn, Ow & Co., Beaver Falls, Pa.

Mining Machinery—
Copeland & Bacon, New York.
Lake Shore Iron Works, Marquette, Mich.
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
Richard O. Jones, Cuyahoga bldg., Cleveland, O.
American Mining & Machinery Co., Cleveland.

Metal Sawing Machines—
Higley Sawing and Drilling Machine Co., New York City.

Moulding Sand—
Garden City Sand Co., Chicago, Ill.
J. Downerd & Son Co., Zanesville, O.
The S. Obermayer Co., Cincinnati, O.

Municipal Bonds—
Frank R. Biedler, Baltimore, Md.

Milling Machines—
Cincinnati Milling Machine Co., Cincinnati.
Godfrey J. Bremer, Kalamazoo, Mich.
Brainard Milling Machine Co., Hyde Park, Mass.
Hill, Clarke & Co., Chicago, Ill.
Prentiss Tool & Supply Co., Chicago, Ill.

Mines and Mining Stock—
Frank R. Biedler, Baltimore, Md.

Mining Engineers—
Richard A. Parker, Marquette, Mich.

Mechanical Engineers—
Richard O. Jones, Cuyahoga bldg., Cleveland, O.

Office Furniture—
Cleveland Desk Co., Cleveland, O.

Ore Crushers—
Bradley Fertilizer Co., Boston, Mass.
Lake Shore Iron Works, Marquette, Mich.
Copeland & Bacon, New York City, N. Y.
American Mining & Machinery Co., Cleveland.

Paint—
Iron Clad Paint Co., Cleveland.
W. W. Lawrence & Co., Pittsburg, Pa.
Jos. Dixon Crucible Co., Jersey City, N. J.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.
Hendrick Mfg. Co., Ltd., Carbondale, Pa.

Photo-Engravers—
National Photo-Engraving Co., Cleveland.

Powder—
Hercules Powder Co., Cleveland.

Power Plants—
Weston Engine Co., Painted Post, N. Y.

Presses—
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Cleveland Stamping & Tool Co., Cleveland, O.

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Prentiss Tool & Supply Co., Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.

Plumbago—
The S. Obermayer Co., Cincinnati, O.

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Lane & Bodley Co., Cincinnati, O.

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B. F. Sturtevant Co., Boston, Mass.
Foos Mfg. Co., Springfield, O.

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Bradley Fertilizer Co., Boston, Mass.
Lake Shore Iron Works, Marquette, Mich.

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Deming Co., Salem, O.
Brightman Stoker Co., Cleveland, O.
Henry R. Worthington, New York City.

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Bickford Drill & Tool Co., Cincinnati, O.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Rock Breakers—
Bradley Fertilizer Co., Boston, Mass.
Lake Shore Iron Works, Marquette, Mich.
Copeland & Bacon, New York City, N. Y.
American Mining & Machinery Co., Cleveland.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.
General Engineering Co., Harvey, Ill.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.

Saws—
Peter Gerlach & Co., Cleveland.

Schools—
Correspondence School of Mechanics, Scranton, Pa.

Second-Hand Machinery—
Prentiss Tool & Supply Co., Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Smokeless Furnaces—
Brightman Stoker Co., Cleveland, O.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Ravenna Boiler Works, Ravenna, O.

Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.
James Murdock, Jr., Cincinnati, O.

Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.

Steel Color Paint—
W W. Lawrence & Co., Pittsburgh, Pa.

Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa.
Wm. Jessop & Sons, Ltd., New York, N. Y.

Scrap Iron & Steel—
Klein & Cohn, Cincinnati, O.

Stokers—
Brightman Stoker Co., Cleveland, O.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
Godfrey J. Bremer, Kalamazoo, Mich.
Cleveland Stamping & Tool Co., Cleveland, O.
Richard O. Jones, Cuyahoga bldg., Cleveland, O.

Steel, Mushet's—
B. M. Jones & Co., Boston and New York.

Smoke Consumer—
Brightman Stoker Co., Cleveland, O.

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Cleveland Rolling Mill Co., Cleveland.

Stay Bolt Iron—Taylor's—
B. M. Jones & Co., Boston and New York.

Screens for Coal, Ore Etc—
Hendrick Mfg. Co Ltd., Carbondale, Pa.

Schools—
Correspondence School of Mechanics, Scranton, Pa.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.

Tanks—
Ravenna Boiler Works, Ravenna, O.

Time Detectors—
The Pneumatica Watchman Check Co., Columbus, O.

Tin Plates (Roofing)—
Merchant & Co., Philadelphia, Pa.

Tinners' Hardware—
Berger Bros, Philadelphia, Pa.

Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.

Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.

Tramways—
Trenton Iron Co., Trenton, N. J.

Trucks—
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Detroit Foundry Equipment Co., Detroit, Mich.

Watchman Time Detectors—
The Pneumatic Waschman Check Co., Columbus, O.

Wheelbarrows—
Akron Tool Co., Akron, O.
Kilbourne & Jacobs Mfg. Co., Columbus, O.

Wire Belting—
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Wire Rope—
Trenton Iron Co., Trenton, N. J.

Tumblers—
Detroit Foundry Equipment Co., Detroit, Mich.

Turret Drills—
A. P. Quint, Hartford, Conn.

Twist Drills—
Cleveland Twist Drill Co., Cleveland.
The Whitman & Barnes Mfg. Co., Akron, O.

Ventilating Fans—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.
B. F. Sturtevant Co., Boston, Mass.

Vises—
Capital Machine Tool Co., Auburn, N. Y.

Well Drilling Machinery—
Williams Bros., Ithaca, N. Y.

Wood-Working Machinery—
J. A. Fay & Egan Co., Cincinnati, O.

Wire Machinery—
John Adt & Son, New Haven, Conn.

Washers—
Milton Mfg. Co., Milton, Pa.

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Addyston Pipe & Steel Co., Cincinnati, O.
Radford Pipe & Foundry Co., Cincinnati O.

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Are most cordially solicited to investigate the merits of the country reached by the Baltimore & Ohio Railroad. We sincerely believe we can demonstrate that the natural advantages, which exist along this system of railroad, cannot be obtained as a whole on any other transportation line in the world. Goods cheaply made are half is a truism, and we venture the assertion that a greater variety of factories can be operated along the Baltimore & Ohio, and at less cost for production, than any other section of the United States. We are ready to assist Manufacturers in reaping the benefits of these advantages. Correspondence solicited.

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The Advertiser who sticks to printer's ink in dull months will find trade sticking to him when the turn comes.

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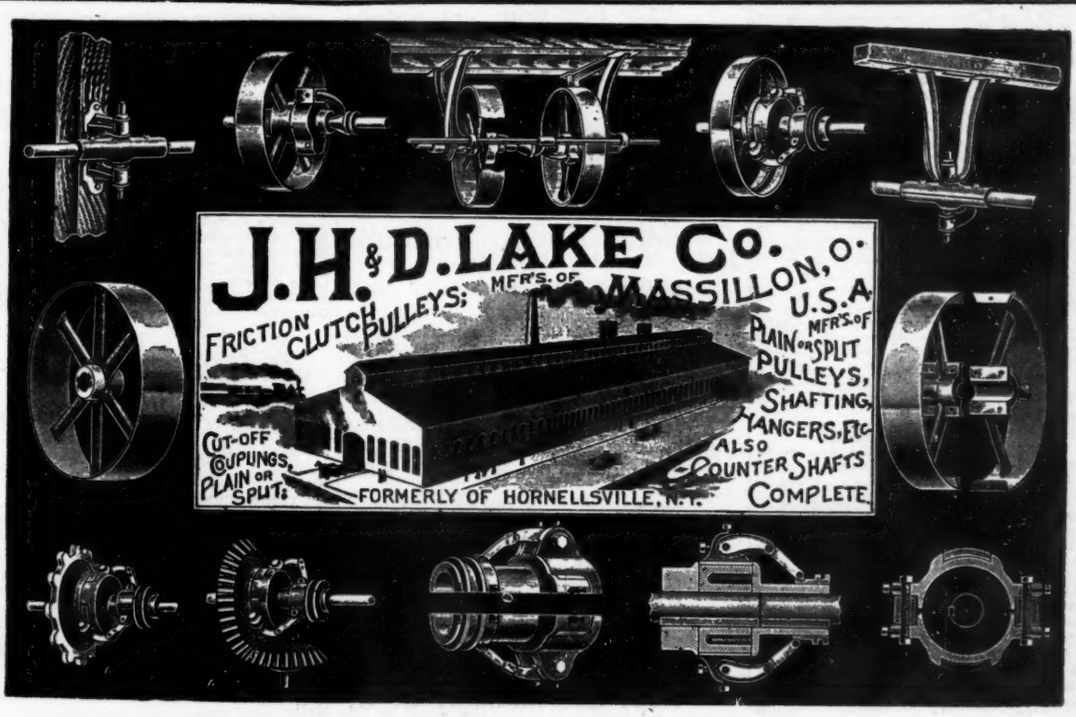
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MFR'S. OF PLAIN OR SPLIT PULLEYS, SHAFTING, HANGERS, ETC. ALSO COUNTER SHAFTS COMPLETE.
CUT-OFF COUPLINGS, PLAIN OR SPLIT;
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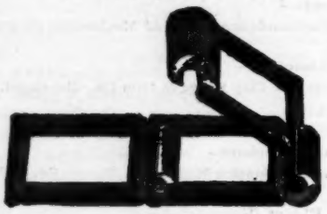

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is a foremost element of success in advertising. Because the reader of an advertisement is not in a humor to buy when he sees it the first time, is not conclusive of the value of that advertisement in his case. Constant familiarity with the announcement of a particular boiler, a particular engine, a particular machine tool, brings the maker to mind when the time does come for making contracts. The men who make freest acknowledgment of their obligation to advertising are the ones who have

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[On Lake Erie docks.]

Low Phosphorus Bessemer	$4.15@$5.00
No. 1 Specular, Bessemer	4.00@ 0.00
No. 1 Bessemer hematite	3.50@ 3.75
Hematites No. 1 non-Bessemer	2.75@ 3.25
No 1. Specular, non-Bessemer	3.00@ 3.50

PIG IRON.

CLEVELAND (f. o. b. cars):

Bessemer	$12 00@ 00 00
No. 1 Strong Foundry	12 50@ 13 00
No. 2 Strong Foundry	11 50@ 12 50
No. 1 Grey Forge, red short	11 50@ 12 75
No. 2 Gray Forge, neutral	11 25@ 11 50
No. 1 American Scotch	13 50@ 00 00
No. 2 American Scotch	12 50@ 00 00
Lake Superior Charcoal	15 00

PITTSBURGH (reported by A. H. Childs):

No. 1 Foundry	$12 50@$13 00
No. 2 Foundry	11 50@ 12 00
Grey Forge	11 00@ 11 50
White and Mottled	10 75@ 00 00
Warm Blast Charcoal	18 00@ 21 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	11 75@ 12 50

CHICAGO (reported by our representative:)

Lake Superior Charcoal	$16 00@$16 50
Local Coke Foundry No. 1	13 50@ 14 00
Local Coke Foundry No. 2	12 75@ 13 00
Local Coke Foundry No. 3	12 50@ 12 75
Local Scotch Foundry No. 1	14 00@ 14 50
Local Scotch Foundry No. 2	13 50@ 14 00
Local Scotch Foundry No. 3	13 00@ 13 50
Southern Coke No. 1	14 10@ 14 35
Southern Coke No. 2	12 35@ 12 60
Southern Coke No. 3	11 85@ 12 10
Southern No. 1 Soft	12 35@ 12 60
Southern No. 2 Soft	11 85@ 12 10
Southern Silveries No. 1	14 50
Southern Silveries No. 2	13 50
Ohio Silveries No. 1	16 50@ 17 00
Ohio Silveries No. 2	16 25@ 16 75
Ohio Strong Softeners No. 1	15 50@ 16 00
Ohio Strong Softeners No. 2	15 50@ 16 00
Tennessee Charcoal	16 00@ 16 50
Alabama Car Wheel	18 50@ 18 75

CINCINNATI (reported by Rogers, Brown & Co.):

Southern Coke No. 1, Foundry	$12 75@$13 00
Southern Coke No. 2 and No. 1 Soft	11 00@ 11 25
Hanging Rock Coke, No 1	14 50@ 15 00
Hanging Rock Charcoal No. 1, Fdy	18 50@ 19 00
Tennessee Charcoal No 1	14 00@ 14 50
Jackson County Stone Coal No 1	15 50@ 16 00
Southern Coke, Grey Forge	10 00@ 10 25
" " Mottled	9 75@ 10 00
Standard Alabama Car Wheel	17 50@ 18 00
Tennessee " "	16 00@ 16 50
Lake Superior " "	17 00@ 17 50

BUFFALO (reported by Rogers, Brown & Co.)

Mahoning and Shenango Valley, strong, No. 1 Foundry	$13 75
Mahoning and Shenango Valley, strong, No. 2 Foundry	13 25
Ohio Softener No. 1	14 00
Ohio Softener No. 2	13 00
Jackson Co. Silvery, No. 1	$16 80@ 17 30
Jackson Co. Silvery No. 2	15 00@ 16 00
Lake Superior Charcoal	15 75
Tennessee Charcoal	16 00
Southern Softener No. 1	13 15
Alabama Car Wheel	18 00
Hanging Rock Charcoal	20 50

LOUISVILLE (reported by Geo. H. Hull & Co.)

Southern Coke No. 1 Foundry	$12 50@$13 00
Southern Coke No. 2 Foundry	11 25@ 11 75
Southern Coke No. 3 Foundry	10 75@ 11 00
Grey Forge	10 25@ 10 75
Spathite	12 00@ 12 50
Southern Charcoal No. 1 Foundry	15 00@ 16 00
Car Wheel	17 50@ 17 75

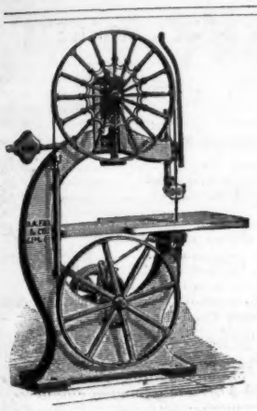
ST. LOUIS (reported by Rogers, Brown & Meacham):

Southern Coke No 1	$13 25@$13 50
Southern Coke No. 2	11 75@ 12 00
Southern Coke No. 3	11 25@ 11 50
Southern Grey Forge	10 50@ 11 00
Southern Charcoal No. 1	15 50@ 16 00
Missouri Charcoal No. 1	14 00@ 14 50
Ohio Softeners	16 50@ 17 00
Lake Superior	17 50@ 18 00
Southern	17 50@ 18 00
Connellsville Coke. St. Louis	5 00

OLD RAILS AND SCRAP METAL.

[Prices paid by mills.]

	Gross Tons
Old iron rails	$18 00
Old steel rails	13 50
	Net Tons
No. 1 R. R. wrought scrap	$12 00
No. 1 wrought scrap	12 00
No. 1 Machine cast scrap	10 00
Iron axles	17 00
Axle turnings	11 00
Wrought turnings (free from cast)	9 00
Cast borings	6 50
Uncut wrought iron boilers	5 00
Steel boiler Plates	10 00
Grate bars	5 00
Pipes and flues (clean)	9 00
Tank iron	8 00
Hoop and band iron	7 00
Sheet iron	7 00
Wrought drillings	7 00
Malleable iron	8 50



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Beams and Channels (f. o. b. mill)	1.60c@1.70c
Angles	1.50c@1.60c
Tees	1.80c@1.90c
Universal Plates	1.60c
Sheared Plates	1.70c

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 60
4½ to 6 by ⅜ to 1 inch	1 65
1¾ to 6 by 1¼ to 2 inch	1 80
1¾ & 1¾ by ⅜ to ¾ inch	1 65
1 & 1⅛ by ⅜ to ¾ inch	1 70
⅝, ¾, ⅞, by ⅜ to ⅝ inch	1 80

Round and Square.

1 to 1⅞ inch	1 60
2 to 2⅝ inch	1 70
2¾ to 3¼ inch	1 85
3⅜ to 4 inch	2 10
4¼ to 4½ inch	2 79
4¾ to 5 inch	2 95

Oval.

⅞ to 1¼ inch	1 80
⅝ to ¾ inch	1 80
½	2 00
⅜	2 20

Half Oval and Half Round.

1½ to 3 inch	2 15
⅞ to 1½ inch	1 95
⅝ to ¾ inch	2 20
½	2 35
⅜	3 45

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch	1 70
1 to 1⅜ by ¼ and 5-16 inch	1 75
¾ to ⅞ by ¼ and 5-16 inch	1 85
½ to ⅝ by ¼ and 5-16 inch	2 10

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	2 15
1 7-16 to 2, No. 17, 18 and 19	2 20
1 7-16 to 2, No. 20	2 30
1 7-16 to 2, No. 21	2 40
1 7-16 to 2, No. 22	2 50
1⅛ to 1⅜, No. 13, 14 and 15	2 20
1⅛ to 1⅜, No. 16, 17 and 18	2 25
1⅛ to 1⅜, No 19 and 20	2 30
1⅛ to 1⅜, No. 21	2 40
1⅛ to 1⅜, No. 22	2 50
15-16 and 1 inch, No. 13, 14 and 15	2 25
15-16 and 1 inch, No. 16, 17 and 18	2 30
15-16 and 1 inch, No. 19 and 20	2 40
15-16 and 1 inch, No. 21	2 50
15-16 and 1 inch, No. 22	2 60
⅞, No. 13, 14 and 15	2 40
⅞, No. 16 17 and 18	2 50
⅞, No. 19 and 20	2 60
⅞, No. 21	2 70
⅞, No. 22	2 80
13-16, No. 13, 14 and 15	2 50
13-16, No. 16, 17 and 18	2 60
13-16, No. 19 and 20	2 70
13-16 No. 21	2 80
13-16, No. 22	2 90
¾, No. 13, 14 and 15	2 60
¾, No. 16, 17 and 18	2 75
¾, No. 19 and 20	2 85
¾, No. 21	2 95
¾, No. 22	3 05
11-16, No. 13, 14 and 15	2 85
11-16, No. 16, 17 and 18	2 90
11-16, No. 19 and 20	3 00
11-16, No. 21	3 10
11-16, No. 22	3 20
11-16, No. 23	3 30
⅝, No. 13, 14 and 15	2 90
⅝, No. 16, 17 and 18	3 00
⅝, No. 19 and 20	3 10
⅝, No. 21	3 20
⅝, No. 22	3 30
⅝, No. 23	3 40
9-16, No. 13, 14 and 15	3 10
9-16, No. 16, 17 and 18	3 20
9-16, No. and 20	3 30
9-16, No. 21	3 40
9-16, No. 22	3 50
9-16 No. 23	3 60
7-16 and ½ inch, No. 13, 14 and 15	3 30
7-16 and ½ inch, No. 16, 17 and 18	3 40
7-16 and ½ inch, No. 19 and 20	3 50
7-16 and ½ inch, No. 21	3 60
7-16 and ½ inch, No. 22	3 70
7-16 and ½ inch, No. 23	3 80
⅜, No. 13, 14 and 15	3 80
⅜, No. 16, 17 and 18	3 90
⅜, No. 19 and 20	4 00
⅜, No. 21	4 30
⅜, No. 22	4 40
⅜, No. 23	4 55

Light Band.

1½ to 6 by ⅛ to 3-16 inch	1 90
1¼ to 6 by Nos. 11 and 12	1 95
1 to 1⅜ by ⅛ to 3-16 inch	1 95
1 to 1⅜ by Nos. 11 and 12	2 00
⅞ and 13-16 by ⅛ to 3-16 inch	2 10
⅞ and 13-16 by Nos. 11 and 12	2 15
¾ and 11-16 by ⅛ to 3-16 inch	2 20
¾ and 11-16 by Nos. 11 and 12	2 25
⅝ and 9-16 by ⅛ to 3-16 inch	2 35
⅝ and 9-16 by Nos. 11 and 12	2 40
½ by ⅜ to 3-16 inch	2 50
½ by Nos. 11 and 12	2 55

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 10
⅞ inch, " " " " 13 and 14	2 20
¾ inch, " " " " 11 and 12	2 25
¾ inch, " " " " 13 and 14	2 45

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No. 12	2 20
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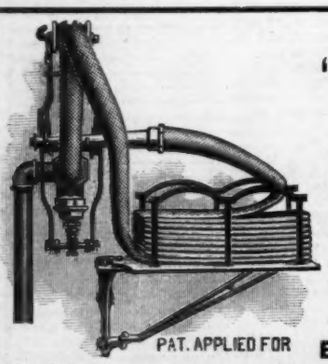

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⅛ to 6 in	10¼
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" Independent	dis 40
" Little Giant Drill	dis 30
Horton's Universal	dis 40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
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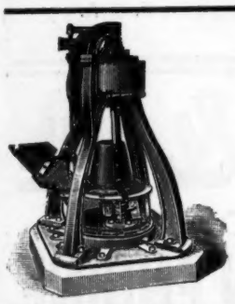

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Norton's	dis 55@60
Grant	dis 55@60
Sterling	dis 60
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Northampton	dis 55
Crystal	dis 65@70
Vitrified	dis 60
Vulcanite	dis 60&10
Hamden	dis 60&10
Cyclone	dis 60

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F.	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 25
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 50
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs.	15c
" " " " over 5 lbs.	12c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3½	3½
Hexagon	15½	11½	8½	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887	dis 75
Standard Penny Nails, ℔ keg card rate	
{ Car lots	$1.55
{ Less than car lots	$1.65

Oilers.

Zinc and Tin	dis 60
Brass and Copper	dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz.	dis 10@10&10

Packing, Steam.

Boston Belting Co.	dis 60
American Packing Hemp	℔ lb 9@10
Russia " "	℔ lb 14
Italian " "	℔ lb 13@19
Plumbago Piston	℔ lb 40
Peerless	℔ lb 60
Morrison's "	℔ lb 50
Square Flax "	℔ lb 50
Sheet Rubber	℔ lb 12&24
Excelsior Rubber	℔ lb 48
Rainbow { Full Rolls	45c ℔ lb
Rainbow { Less than Full Rolls	50c ℔ lb
Eclipse Gasket	℔ lb 75

Picks.

Railroads, 5 to 6 lbs	$12 dis 60
" 6 to 7 lbs	$13 dis 60

Pulleys.

Iron Pulleys, Walker List	dis 40
Medart Pulleys	dis 50
Split Wood Pulleys	dis 50@55

Rivets.

Iron, Thousand, list November 17	dis 50&10@60
Iron, Ordinary, Cooper's Block and Carriage list November 17	dis 50&10@60
Copper	dis 50@50&10

Saws.

Disston's Circular	dis 40&10
" Band	dis 25
" Scroll	Net
Hack Saw Stubs	dis 20
" " Eureka	dis 20
" " Star	dis 20
Saw Swages Diston's	dis 30
Atkins' Circular Saws	dis 40&45
" Mill, Mulay and Drag Saws	dis 40&10
" Wood Saws	dis 40&10
" Silver Steel Diamond Cross-cut Saws	70c per ft
" Dexter Cross-cuts	50c "
" Diamond "	30c "
" Tuttle Tooth Cross-cuts	25c "
" One-man Cross-cuts	32c "
No. 1 Handles	23c per pair
No. 6 "	16c "
Excelsior Saw Tools	$6 per doz
Derfection "	$15 "
Petroit Saw Works, Circular	dis 50
" " " Band	dis 25
" " " Mulay	dis 45

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

New List, Jan. 18, 1884

Brass	dis 30
Copper	dis 40
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ℔ dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40

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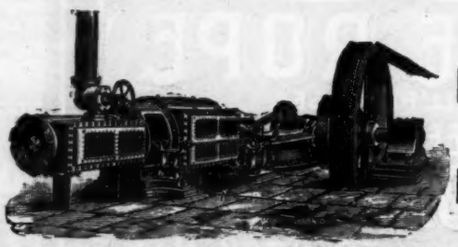

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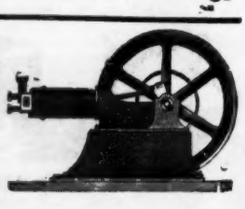

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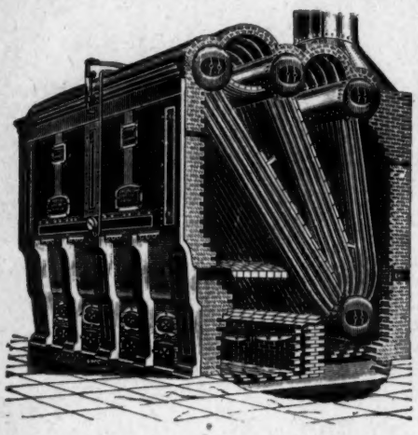

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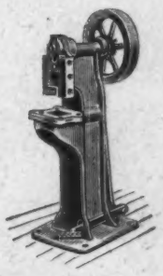

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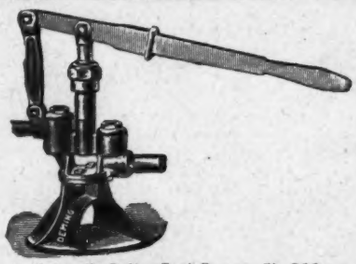

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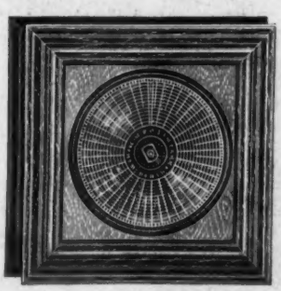

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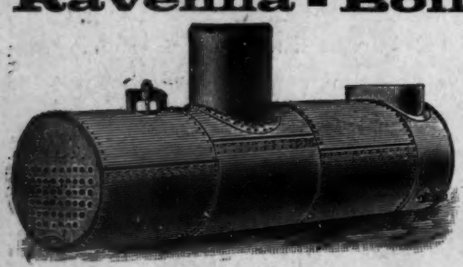

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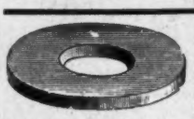

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